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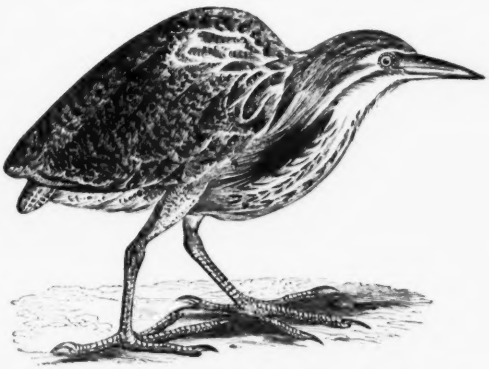
BITTERNS.

BY WILLIAM E. ENDICOTT.

MANY persons are repelled by scientific nomenclature. Let not such, however, turn away from this article when I say that the name of the genus I write of is *Botaurus*, for the English term "bittern" is the same word, only in a dif-

Fig. 36.*



ferent shape, and comes from the Latin *Botaurus* (*i. e.*, *boatus taurinus*), through the French *butor*, or Spanish *bitor*. *Botaurus*, *butor*, *bitor* or *bittern*, it is all one, and means "bull-voiced." The popular local names the bird has re-

* *Botaurus lentiginosus* Stephens; from Tenney's Zoölogy.

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ceived are nearly all from the same characteristic: these are Stake-driver, applied to our own bird, and Mire-drum, Bull of the Bog, Butter-bump and Bog-blutter (*i. e.*, bleater), applied to the European species.

Australia is a land of anomalies; a kingfisher lives there which avoids the water, dwells in arid wastes, living on lizards and snakes, and has his home in a tree; and possibly some unknown species of bittern may belong there which flutters about the upland fields and lives on seeds, and will be held in high repute as a warbler when he shall, hereafter, be found, and will be kept in a gilded cage with a cuttle-fish bone. That would indeed be a sight worth going half-way around the world to see. I dare prophesy, however, that that island's vast unknown interior will produce no such wonder, but that all unknown bitterns will be found to agree in character with the known. What that character is, how it differs from our supposed songster, let us now consider.

The prophets use its name in foretelling desolation. Says Isaiah, of Babylon, "I will make it a possession for the bittern;" and Zephaniah says of Ninevah, "The cormorant and the bittern shall lodge in the upper lintels of it." Hear also what Mudie, who was not a prophet, says of the European species. "It hears not the whistle of the ploughman nor the sound of the mattock; and the tinkle of the sheep bell or the lowing of the ox (although the latter bears so much resemblance to its hollow and dismal voice that it has given foundation for the name) is a signal for it to be gone. Places which scatter blight and mildew over every herb more delicate than a sedge; which are the pasture of those loathsome things which wriggle in the ooze, or crawl and swim in the putrid and mantling waters; places which shed murrain over the quadrupeds, or chills which eat the flesh off their bones; places from which even the raven, lover of disease and battener upon all that expires miserably and exhausted, keeps aloof (for 'the reek o' the rotten fen' is loathsome even to him), are the chosen habitation, the only loved home of the

bittern. He is a bird of the confines, beyond which we can imagine nothing but utter ruin."

This picture is, I think, somewhat overdrawn; moreover, no naturalist ought to speak of the waste places of Nature in that disapproving way. We might pardon a mere collector for writing so of bogs and wilds, he knows no better; to him, a natural history store, where he may *buy* his eggs, his shells, his bird-skins, or his sea-mosses, is preferable to the swamps he must struggle through, the thickets he must thread, the plains he must traverse, and the sandy or muddy sea-beaches he must frequent if he would be a *student* of Nature. Dry feet, untired limbs, clothes and flesh untorn by briar and bramble, are not for the naturalist at all hours, nor should he complain; a new plant, a rare mollusk, a bird till now unseen, an egg till now unknown, repay such trials as these; and, if he find no such prize, his tramp, like virtue, is its own reward. That there is something about the fowl, of which Mudie thus speaks, that appeals strongly to the imagination is not to be denied; but the bird is, nevertheless, a reputable bird, although he is the one which ignorant peasants in the old countries know by the name of "night raven," believing that disaster or death must needs follow when they have heard his voice booming over the fens on a warm cloudy night, as they staggered their drunken way home from the ale-house. Terrible as the voice sounds to their dull senses, it is sweetest music to the bittern's mate, sitting among the grasses below him, or with him circling the sky just under the cloud.

On this side of the Atlantic we have no superstitious fear of the fowl, and do not think the swamps accursed by his presence. He is a lovely bird in unprejudiced, discriminating eyes; he has no gaudy colors, but his blacks, his browns and yellows, of many shades, all of them pleasing, are so blended as to produce a beautiful, harmonious effect. He loves waste places, for they furnish him safety and food; safety, because his enemy, man, is fond of a dry foot; and

food, for frogs and snails and snakes and mice, all prime delicacies with our hermit, abound there, and, with an occasional minnow, supply all his wants. And yet his safety is not perfect, for the prying naturalist, for whom mud and water have no terrors, sometimes comes across his home and family; and the wanton gunner, starting him up from his fishing and frogging, never spares him, but shoots him at sight; and what man, with an arm and a leg broken and body pierced with a dozen bullets will make as good a fight as does our bird when the destroyer goes to pick him up? As long as life is in his wrangled body, he never ceases to lunge and thrust at his murderer's eyes with his spear-like bill, scorning to yield to either pain or fear.

He comes to us from Mexico, Central America, and the West Indies (the European species winters in Africa) early in the spring (I bought one, freshly killed, in the latter part of March, 1868, though that was very early indeed), and probably takes up his abode in the same swamp which last year he frequented. The "tinkle of the sheep bell" does not banish the bold bird; he and his mate live in their five or ten acres the whole summer through, although just outside their bushy quagmire the white-shirted haymakers may whet their scythes and shout to their horses, and the locomotive with his thundering train may go tearing by almost every hour in the day. It seems that the raven avoids the bittern's domains, because he don't like the "reek o' the rotten fen." Very well, let him stay away if he likes, the beautiful yellow-throats and swamp-sparrows, and, if there is a rotten stump, the chickadees, make his place good and more than good. With their company and with surroundings of purple-blossomed Kalmia, glossy-leaved Smilax and pink Calopogon, quiet cedars, nodding sedges, and rustling grasses, Old Sooty's absence will be little mourned.

Some speak of finding the bittern breeding in colonies in trees. Good observers say so, and I believe them; but I think that all such cases are owing to accidental circum-

stances, such as the inundation of their marshes. Certain it is that I have never found them so associated. "Le butor," says M. Holandre, "est très sauvage, farouche, solitaire." One tiger's den to a jungle, one eyry to a mountain, and one pair of bitterns to a bog seems to be the rule.

In the place where I have found them, there is retired feeding ground for a thousand, dense cedar swamps extensive enough for as many nests if they only chose to congregate, like their social cousins, the herons; and yet two by two they live, their next neighbors nobody knows how far away,—not in the same swamp at any rate; and on the ground, the bare ground, they lay their four or five eggs, among low laurel, tufts of grass, or, as in the case of the first nest I ever found, at the foot of a swamp huckleberry (from which the four callow young, unable yet to stand, tried to drive me away by repeated tumbling charges, menacing me by clumping their soft mandibles, and by sending angry hisses from their wide-yawning, yellow throats).

I have been surprised to find the general uncertainty which pervades ornithological works, upon the subject of the color of the bittern's eggs. These really are of a dark drab color in the case of our own bird as well as of the European; in fact I could find no distinguishing marks between these two species when examining a large number of both, which I was enabled to do by the kindness of Mr. Samuels. I have not been able to find any variation in the color of those of our species, though I have inspected eggs from all parts of the Union. Hear now what a few of the authorities say: Audubon declares that he never found the bittern's nest, nor, apparently, did he ever see its eggs, for he says nothing of them. Nuttall writes, "the bittern *is said* to lay cinereous green eggs." Wilson, "they breed at Hudson's Bay in swamps, and lay four cinereous green eggs, *we are informed*." Richardson, "they lay, *according to Mr. Hutchins*, four eggs of a cinereous green color." Latham, "breeds at Hudson's Bay, and lays four cinereous

green eggs." Peabody, "eggs of a green color." Thompson, "six eggs, of a dark, bluish-brown, clay color." Finding the venerated authorities determined that the eggs should have green on them of some shade or other, I made a fresh examination, thinking I might have been mistaken. I studied them long and carefully in every light, and gave them full consideration, but it was all in vain. I did once think I had detected a glancing greenish reflection, but found the color came from a window blind. I have stated that the eggs of the American and the European species are just alike. Let us see what European authors say: Selby says, pale green; Bewick, greenish white; Fleming, olive green; a writer for the London Tract Society, pale greenish-ash; Mudie, greenish brown; Albin, whitish, inclining to ashy or green; Latham, pale ash-green; Goodrich, pale green; M. Holandre, *blanc-verdâtre*; Nauman and Buhle give a figure much too dark. It is hard to be obliged to say of so many well known men that their statements are unreliable; but seeing is believing, and the truth is the truth, and the color is as I have said. Mr. Samuels gives the true state of the case with regard to our bird, and Yarrell in regard to the European species, and Hewitson and Atkinson, the former of whom borrowed the specimen he figures from Mr. Yarrell, both give accurately colored plates. When writers will say such things of the European kind, we need not be surprised, however incredulous, when Latham tells us that a Cayenne species lays "round whitish eggs, spotted with green." Besides all these errors, the author of the article "Bittern," in the "New American Cyclopædia," says that the bird "builds in trees, like the herons, ordinarily rearing two young," a statement about as incorrect as it could be. Mudie speaks as follows of the European bittern's voice: "Anon a burst of savage laughter breaks upon you, gratingly loud, and so unwonted and odd that it sounds as if the voices of a bull and a horse were combined; the former breaking down his bellow to suit the neigh of the latter in mocking you from

the sky." "When the bittern booms and bleats overhead one certainly feels as if the earth were shaking." Goldsmith's description of the bittern's voice is one of his most pleasing passages. Many of the poets speak of the bird's strange voice, and even in the time of Thompson (Thompson of the Seasons) it was thought that the bill was thrust into the mud in making it. Chaucer speaks as follows in The Wife of Bath's Tale:

> "And as a bitore bumbleth in the mire,
> She laid hire mouth into the water doun,
> Bewray me not, thou water, with thy soun',
> Quod she, 'to the I tell it, and no mo
> Min husbond hath long asses eres two.'"

Another notion was that the bill was put inside a reed to increase the sound; the truth is, of course, that the bird uses no means to produce its bellow but its own organs of voice. Our own bittern has no such roar, but, as its name in most parts of the country denotes, makes a noise very much like driving a stake with an axe. It has also a hollow croak at the moment of alarm.

These remarks apply to the American and European species; the geographical range of the former is from latitude 60° north, to Central America and the West Indies, having never been found, I believe, south of latitude 10° north. It is of rare occurrence west of the Rocky Mountains, though not uncommon in other parts of the United States. Many specimens of this bird have been shot in the British Isles, particularly in Ireland. The first recorded capture was in Devonshire, England, in October, 1804; the prize was by some regarded as a new species. All such specimens have been killed in the fall, so that there can be no doubt that they were blown out to sea in their autumnal migration.

The European species has a wider range. Selby says it is confined to Europe, but such is not the case; it occurs, though rarely, in Norway, Russia and Siberia, up to latitude 65° north, and is found breeding at the Cape of Good Hope, in latitude 35° south. In the other direction it extends from

the Atlantic to the River Lena, in Siberia, and is found, though sparingly, in Hindostan. It is very rare in the British Islands, owing, probably, to drainage of bogs; so rare in fact, that some naturalists have thought it worth their while to give date and place of the killing of all specimens they have seen. In England it is said to breed only in Lincolnshire, Cambridgeshire and Norfolk. In old times the bittern was held in high esteem for the sport it afforded when pursued by trained falcons. Both birds would mount in spirals, oftentimes out of sight; the bittern straining every nerve to keep above the hawk, the hawk doing his best to rise above the bittern so as to make the fatal pounce. The bittern, being of weaker flight, rarely escaped, but often in his death involved his enemy's; for as the cruel falcon came down with rushing wings, exulting in his fierce soul, the bittern, in his dire extremity, thrusting up his sharp beak, empaled the triumphant savage, and both came tumbling from the clouds together, striking the earth with a thump which drove the last breath from both. A lesson to tyrants not to push the weak to despair.

On account of its furnishing such excellent sport to the humane of former times, rigorous laws for its protection were passed in the reign of Henry VIII, and of Edward VI, which imposed a fine of eight pence and a year's imprisonment for every egg taken or destroyed. There was something like protection. The long hind claw was a most excellent toothpick, for, besides its functions as such, it had, if the wisdom of our ancestors was infallible, the highly meritorious property of preserving the teeth from decay. It appears, moreover, that the fowl had then the power of displaying a brilliant light from the centre of its breast, which attracted fish to it in great shoals, so that the satisfying of its hunger took but a small part of the night, and much time was left for other pursuits, one of the most cheerful of which was to soar above the hovel of the British ploughman or hedger or ditcher, and rouse him from his lethargic sleep

or struggling nightmare with a doleful noise, portending certain death to Hodge, or Joan, or some one else; and this prediction was always fulfilled to the letter, for in the course of the next twelve months some one was sure to die in that county or the next. The flesh of the prophet, however, was very good, provided his skin was stripped off before cooking, that it might not impart a muddy odor and taste.

Thus it will be seen that our bird was a strange compound of good and evil, besides having some magical properties which weighed on neither side; but the march of centuries, which has changed everything for good or ill has had its effect upon the bittern. He can no longer preserve our teeth, nor can he cast a murrain upon our cattle, nor even foretell somebody's death; even his magical light is gone, and he is now a quiet obscure fellow, doing man neither good nor ill, and asking only to be let alone. As to the bitterns of less civilized countries, their manners and customs have never been described at much length, but they appear not to differ much from the American and European species, except that the lineated bittern of Cayenne is said by Latham to be capable of domestication, and to be then an excellent mouser.

The bitterns are all much mottled in plumage, and may be divided by this mottling into three groups, viz.: First, The Rayed Bitterns, in which the mottling takes the form of longitudinal streaks, especially on the breast, in which group are the *Botaurus stellaris* (*i. e.*, the starry) of Europe and Africa; *B. lentiginosus* (*i. e.*, the freckled) of North America, and *B. pœciloptila* (variegated feather) of Australia; this last is now thought to be identical with *B. Australis*. Second, the Spotted Bitterns, such as *Tigrisoma tigrina* (tiger-bodied, tiger-like) of Cayenne, and the Javan *B. limnophilax* (pool-guard, a name which reminds one of Hood's lines:

> "The moping heron, motionless and stiff,
> That on a stone, as silently and stilly,
> Stands, an apparent sentinel, as if
> To guard the water-lily").

Third, the Pencilled Bitterns, such as *Tigrisoma melanolopha* (black necked) of Ceylon and Burmah, and probably of the Malay peninsula; *Zebrilus undulatus* (wavy) of Guiana, and *Tig. Braziliensis*, whose name denotes its habitat. This last is the most beautiful of the family, its back being black, thickly and delicately pencilled with white and rufous; primaries, dark slate; crown, clear bright, and nape clear dark rufous. In front alone does the bird resemble our own, and even there the colors are brighter and more clearly defined.

No part of ornithological research is more fascinating than the study of feathers; the more we examine them the more we must be lost in admiration of their beauty. I have never seen more beautiful feathers than those of the American Bittern. The ones I am at present examining, though they have been plucked from the bird more than a year, retain a beautiful gloss, hardly inferior to that they wore in life. Both webs of the primaries, and the anterior one of the secondaries, have a lovely bloom of a most delicate ashy blue. There is a very regular gradation in texture, coloration, position of the shaft in the vane, and in most particulars of shape, from the first primary to the last tertial, the former being very dense, strong, of a clear unflecked slaty blue, with but one or two mere hairs of down; end acutely angled, with the shaft very near the anterior edge; the latter very loose in texture, so weak that a mere touch serves to tear its fibres apart; in color slaty brown, most finely marked with wavy lines of rusty brown, and not only very downy three-fourths of the distance to the tip, but furnished with a very soft accessory plume, three inches long and two wide: the tip widely rounded, and the shaft at the very centre. Besides these differences, there is also observable a certain indefinite youthfulness, if I may so express it, of color, which distinguishes the tertials from the secondaries; and the secondaries again have an immature, diffident appearance of texture, as compared with the primaries. No

words can express the extreme delicacy and downy softness of some of the body feathers, particularly those of the lower part of the breast, one of which now before me measures $3\frac{3}{16}$ inches in length, and $3\frac{7}{32}$ in breadth. Our species, like the European, has a black-lead colored patch on the sides of its neck, the feathers of which are very unlike common ones, being little more than shafts with parallel hairs arranged along their sides.

I have given no close descriptions of the various species, because, though such may serve to identify a bird in the hand, they seldom give any vivid idea of an unseen one in the bush. As to size I may remark that *B. Braziliensis* is the largest species, and *Zebrilus undulatus* the smallest, standing less than half as high as our bird.

There is a series of small waders found, one or more species in every country, called "small bittern," "least bittern," etc., which I leave out, because I believe they are much nearer the herons, for the following reasons: The bitterns are all thickly mottled; the herons are colored in spaces of clear color,—so are most of the "little bitterns." The characteristic color of the bitterns is brown of different shades; of the herons, different shades of ash,—as is the case with most of the "little bitterns." The bittern's feathers stand out so that the bird, particularly about the neck, looks thick and even clumsy; the heron's feathers are so arranged as to give an elegant look to the wearer of them,—so are the "little bittern's." The bittern's egg is of the color I have said; the heron's is of a clear, light green,—so is the "little bittern's." In fact the night-herons bear a much greater resemblance to the bitterns than do the small series we have been speaking of. In conclusion, I would say that I have endeavored to make this article correct throughout, but that it is very likely that it has its errors and omissions. I shall be glad to have the former corrected, and the latter supplied.

THE MULE DEER.

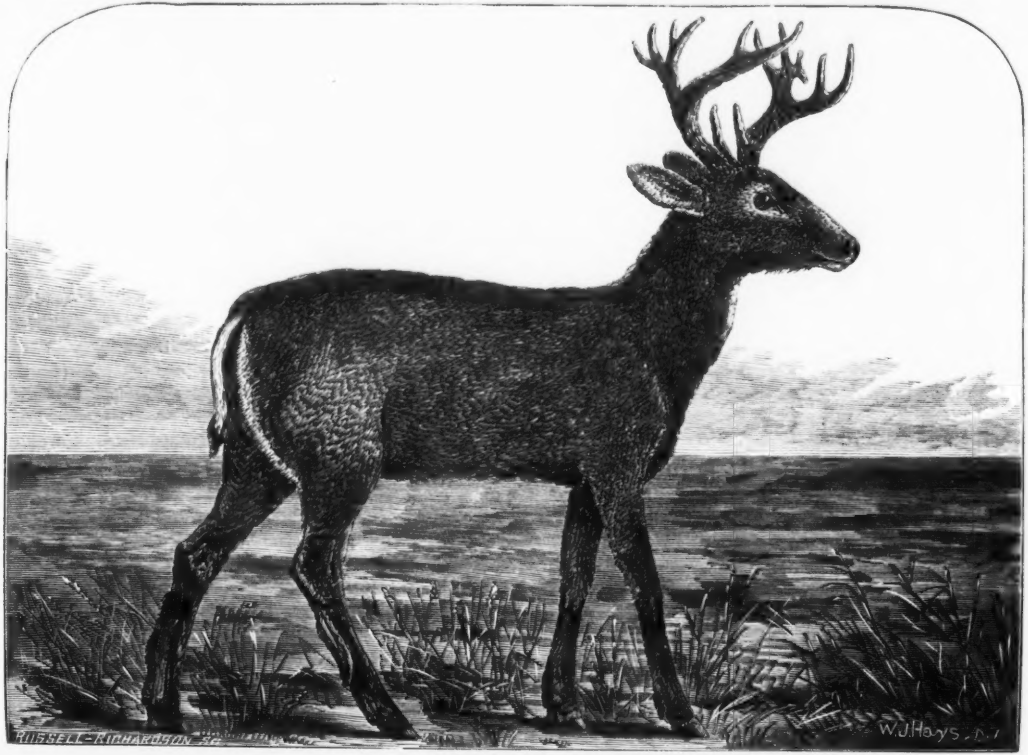
BY W. J. HAYS.

THE Mule Deer* (Plate 3) was first mentioned by Lewis and Clark in the report of their journey up the Missouri River. They gave it the name of Mule Deer on account of the length of its ears; the length of the ear, however, varies with individuals. I have one head which I procured on the Upper Missouri, the ears of which measure nine inches from the head, and one from the Platte with ears only seven inches in length; these measurements are from adult males. The description of Mr. Say gives ten inches. Mr. Say first described it and gave it the name of *Cervus macrotis*.

This deer is much coarser and less graceful than the *Cervus Virginianus;* its limbs are thicker and longer, although it does not vary much in weight from the largest of the common deer found in the Adirondack Mountains.

The color in summer is a dull grayish brown, and in winter a silvery gray on the body, a line of black on the back and on the breast between the fore legs; the legs are a bright brownish yellow, the upper part of the inside white. The forehead is covered with dark brown hair extending down to a line a little below the eyes. The upper lip and chin are white; there is a band of dark brown running into black, extending from the nostril to the edge of the upper lip. The black band is not so well defined on the lower jaw as in the common deer. The inside of the thighs up to the tail is white; there is also a slight indication of white under the neck. The belly is a yellowish brown, almost as bright as

* *Synonymes.*— Black-tailed or Mule Deer, Lewis and Clark. *Cervus auritus*, Warden's United States, vol. I, p. 245. Cerf Mullet, Desmarest, Mammalogie, p. 43. Jumping Deer, Umfreville, Hudson's Bay, p. 164. Great-eared Deer, Griffith's Animal Kingdom, vol. IV, p. 133. *Cervus macrotis* Say, Long's Ex., vol. II, p. 254. *Cervus macrotis*, Harlan's Fauna, p. 243. *Cervus macrotus* Sabine, Franklin's Journey, p. 667. *Cervus macrotis*, Goodman's Natural History, vol. IV, p. 133. *Cervus macrotis* Peale, Philadelphia Advocate of Science, August, 1834.



HAYS ON THE MULE DEER.

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the color on the legs. The tail is seven inches in length, round, and covered with short white hair, like the tail of a pointer dog; the extreme tip, for about an inch, has black hair of about two inches in length. The tail is carried pendant, and not erect, in running.

The metatarsal gland (which in the common deer is about an inch long) is six inches in length and fringed with hair two inches in length. The ears have a line of brownish black on the edge, and are lined with long whitish hair. The horns spread wider, some measuring twenty-four inches between the tips in front, but otherwise have the general form of those of the common deer, but the points are bifurcated; and sometimes have as many as three and four branches. The hoofs are black, and not so sharp or pointed as the common deer, resembling more in form the hoofs of the Wapiti.

This description is made from specimens in my possession and from those that I have seen on the Plains, and differs somewhat from that of Prof. Baird. I am inclined to think that his description of the hoof was made from a specimen that had become dry and contracted at the base, or else of a young animal.

This deer is found from the north of New Mexico to the Saskatchewan, and from the Missouri to the Cascade Mountains. Its flesh is very fine eating, esteemed by many superior to that of the common deer.

DIMENSIONS.

	ft.	in.		in.
Total length from tip of nose to tip of tail,	6	1	Length of ear,	9
Height at shoulder,	3	2	Width, "	5
" top of pelvis,	3	6	Length of tail,	7
Girth behind shoulder,	3	4	" suborbital sinus,	1
Girth of neck,	1	10	" metatarsal gland,	6
Length of fore leg from end of hoof to olecranon,	2	0	" hair on metatarsal gland,	2
Length of hind leg from hoof to patella,	2	7	Length of fore hoof,	2½
Length of face,		10	" hind hoof,	2¼
Width between orbits,		5	Greatest width of fore hoof,	1¾
			" " hind hoof,	1¾
			Length of false hoof,	1

THE NATURALIST IN CALIFORNIA.

BY J. G. COOPER, M. D.

Los Angelos Plains.—In December, 1860, I found myself at Los Angelos, under orders to report at Fort Mojave, Colorado Valley, as soon as practicable. I therefore started on the fourth, in company with a train of wagons going with supplies to the Fort, mounted on a mule, and well supplied with material for collecting in that little known region.

The southern part of California, even near the coast, was still brown and barren looking from the effects of the long dry season, although some rain had fallen for a month past. There is very little tree growth except along the streams, and most of these sink in the dry season before reaching the sea, so that the nearly level plain bordering the coast for a width of twenty-five miles has a desolate appearance, though it is densely covered with herbage, and in spring puts on a garb of the most beautiful green, varied with myriads of pretty flowers. Already the lower grounds along the river bed are commencing to revive, and flocks of geese (*Anser hyperboreus* and *Bernicla Gambelii*) begin to enliven the scene; the Kill-deer (*Ægialitis vociferus*), a constant resident where water is permanent, and occasionally flocks of other waders are seen.

But the route leads away from the haunts of these semi-aquatic migrants, over the driest part of the plain towards Cajon Pass, and although animals of all kinds are less abundant there now than in the moist spots, they are more distinct from those of the Atlantic States. Ground Squirrels (*Spermophilus Beecheyi*) abound, their villages occupying every little elevation, and the squirrels themselves, which do not hibernate here, may be seen running in all directions or sitting erect near their burrows, and allowing a very near approach, confident that they can escape under ground from any

enemy. But occasionally a Squirrel Hawk (*Archibuteo ferrugineus*) is seen sitting on the ground devouring one of these audacious burrowers. The White-headed Eagle and various smaller hawks, are also on the watch for these and any other small animals they can catch, such as Gophers (*Thomomys umbrinus*), Jumping-mice (*Dipodomys agilis* and *Perognathus parvus*), Wood-mice (*Hesperomys Sonoriensis*), Hares (*Lepus Californicus* and *Audubonii*), besides such birds as fall in their way.

About the gardens are the omnipresent House Finch (*Carpodacus frontalis*), the Black Pewee (*Sayornis nigricans*), Raven and Western Crow (*Corvus carnivorus* and *caurinus*). The Western Flicker (*Colaptes Mexicanus*) was the only one of its tribe observed in this nearly woodless plain. Large flocks of Gambel's Finch (*Zonotrichia Gambelii*), and other species, flitted among the hedges, while the Golden-crowned Wren and Audubon's Warbler were the only insectivorous species that could glean a subsistance at this season among the dry willows. The Song Sparrow (*Melospiza Heermannii*) like its eastern representative enlivens the early morning with an occasional song, while the Rock Wren (*Salpinctes obsoletus*) and Cactus Wren (*Campylorhynchus brunneicapillus*) chirrup loudly from the tiled roof or dense thickets. Flocks of Quails (*Lophortyx Californicus*) become common as we get farther from the town, and the little Burrowing Owl (*Athene cunicularia*) is often seen sitting sleepily at the mouth of an old squirrel burrow. Meadow Larks and Horned Larks, as well as the little Pipit, are so numerous in places on the bare plains as to almost darken the air when they fly, and the curious Mountain Plover (*Podasocys montanus*) run in scattered flocks over the driest tracts, or wheel in swift columns around the sportsman, their white underparts sometimes shining like snow-flakes as they turn like their more aquatic cousins of the seashore.

Thus it will appear that these plains have a great variety of animals, even as seen in a hasty journey and at a bad

season, but nothing very peculiar to this part of the State occurred. Two fine specimens of the Red-tailed Black Hawk (*Buteo calurus*) would not allow of a very near approach, and the first specimen collected was a Cassin's Kingbird (*Tyrannus vociferans*), which I could scarcely believe a winter resident, although I have since found it to be so, even as far north as Santa Cruz, while its closely allied relative, the *T. verticalis*, leaves the State entirely in winter.

Approaching the mountains at Cajon Pass, extensive thickets of shrubbery, with occasional low trees, give promise of a new and more varied fauna in the spring, but at this season few animals were seen besides those mentioned. A Coyoté (*Canis latrans*) dogged our steps in hopes of some scraps to be left at camp, and at night the dismal barking howl of these animals was our constant serenade. Nests of the Wood-rat (*Neotoma Mexicana*) were common, consisting of twigs, bark, etc., piled up three or four feet high among the bushes.

Hares became so numerous that I saw more than twenty during the day while riding along the road, and a new bird appeared in pairs, or small families, running on the ground with much the appearance of Snow-birds. This was Bell's Finch (*Poospiza Bellii*), one of the more southern group. I also shot a black-tailed Gnat Catcher (*Polioptila melanura*), the most peculiar of the three allied species found in this State, which was hopping among the low bushes, scolding like a wren.

The weather here was warm and pleasant by day, but frosty at night. Insects were scarce, and I searched in vain for mollusca, though several fine snails are found on the neighboring mountains where limestone abounds. As I am, however, only giving my observations on that particular journey, I omit for the present to mention these and many higher animals, which I have since found to be inhabitants of the same region.

Large groups of Live Oak (*Quercus agrifolia*), seen at a

distance only, surrounding San Gabriel and San Bernardino, would no doubt yield many birds and other animals not observed along the route traversed.

Cajon Pass.—The pass is entered quite abruptly from the plains by a picturesque cañon, usually narrow and rocky, through which flows a dashing mountain stream, clear and cold, but not observed to contain fish. Along its banks grow Live Oaks, Buttonwoods (*Platanus Mexicanus*), and various Willows, while a few Pines (*Pinus Sabiniana?*), Firs (*Abies Douglassii*) and Nut Pines (*P. monophyllus*) straggle down from the neighboring mountains. The slopes of the nearest mountains are, however, covered chiefly with low shrubs. Among these the loud ringing trill of the Wren Titmouse (*Chamæa fasciata*) was the chief bird-music at this season. Other birds observed were a flock of Pigeons (*Columba fasciata?*), Lawrence's Goldfinch (*Chrysomitris Lawrencii*), and the Western Bluebird (*Sialia Mexicana*), none of which frequent the bare plains below. Just below the summit, where we camped December 7th, I shot the first seen of the Shining Flycatcher (*Phainopepla nitens*), a species rare west of these mountains, and peculiar enough to attract attention from its habit of flying upward from a bush to a great height, in a zigzag manner, in pursuit of insects, somewhat like Pewees, which it much resembles otherwise. I have heard of the Mountain Quail (*Oreortyx pictus*) as occurring in this spot. The Pass being only about 4000 feet above the sea, and the mountains around it low and nearly treeless, does not offer so good a field for a collector as would be the San Bernardino range, which rises over 8600 feet forty miles south-east of here, and is covered high up with heavy coniferous and oak timber. The light coating of snow which greeted our eyes on the summit the morning of December 8th, is an index of the greatest cold ever experienced here, though the summits of the highest mountains in sight are often white in patches the entire summer.

As we are now about to enter on a new natural region,

that of the interior deserts, I may as well digress a little from the line of travel to mention some other land animals I have observed west of this range, and north of latitude 34° 30′, a region which I have called the "Southern coast-slope" of California, extending north-east and south-west for about one hundred and forty miles, and fifty in breadth. Besides the mammalia mentioned, the Coast Fox (*Vulpes littoralis*), if really distinct from the Gray, does not occur northward. Deer (*Cervus Columbianus* and *C. Mexicanus?*) are not uncommon, and some small feline animals (*Felis eyra?*) with long tails, are said to occur. The Jaguar (*F. onca*) has been reported, but all other mammals except Skunks (*Mephitis occidentalis* and *M. bicolor*) are rare.

The Couguar (*Felis concolor*), Grizzly Bear (*Ursus horibilis*), Raccoon (*Procyon Hernandezii*), Badger (*Taxidea Americana*), Wild Cat (*Lynx rufus*), Gray Squirrel (*Sciurus leporinus*), Antelope (*Antilocapra Americana*) and Mountain Sheep (*Ovis montana*) occur more or less abundantly in various stations on the mountains or plains, but most of them are limited to particular spots, and are more abundant in other parts of the State.

The most peculiar birds not yet mentioned are the Contraband Hawk (*Buteo zonocercus*), which I found but once near San Diego, in February; the Rock Swift (*Panyptila melanoleuca*), a few of which breed in some cliffs near the same place; the Texan Nighthawk (*Chordeiles Texensis*), a summer visitor, the Little Vireo (*Vireo pusillus*) and Hooded Oriole (*Icterus cucullatus*), also migratory; the Long-tailed Mocking-bird (*Mimus caudatus*) and Long-billed Sparrow (*Ammodromus rostratus*), the latter confined to the seashore. These, as well as the White-bellied Auk (*Brachyramphus hypoleucus*), have not been found farther north, though the land species mostly occur farther east. Altogether I have noticed forty-eight species of mammals, and two hundred and forty-eight of birds, in this region. Of the birds thirty-two are summer visitors, thirty-two winter, and the rest resident.

Of reptiles I found twenty-eight species and six of batrachians, a few of the former are not known northward, viz., Hallowell's Rattlesnake (*Crotalus Hallowelli* nom. prov.), the Coppery Whipsnake (*Drymobius testaceus*), and Couch's Gartersnake (*Eutainia Couchii*). Two species of Gerrhonotus (*G. Webbii* and *G. olivaceus*) are also reported as only from these mountains, and I found two other undetermined lizards on the seacoast and Clauente Island. The fishes are few in the fresh water, and as yet undetermined.

On my return to the coast, just six months later, I found the summer fauna of this region in full development. The Rock Swifts flew high over the mountains with harsh croaking notes; the Vireos and Orioles sung sweetly in the high trees; the Mocking Bird, and many others, enlivened the shrubbery or chaparal, and at evening the Nighthawks flew swiftly about our camps. Humming Birds of various species had nests on the trees, of which I unfortunately upset one and broke the eggs before I saw it. Brilliant flowers abounded, and though the dry season was commencing in the plains, the mountains were so inviting that I much regretted my inability to spend a month or two there before going to the military post at San Diego.

The Desert.—The whole country between the mountains and the Colorado Valley may be called desert, although only that part near the mouth of the river is called so on the maps, being nearly level and almost as barren of vegetation as the sea-beach. The route to Fort Mojave passes over an undulating country, destitute of trees except on the summit of the San Francisco Mountains, where it rises over 5000 feet above the sea. The lower tracts consist of salt or alkaline flats, sand-hills or bare rocks, while the higher support only a scanty and useless vegetation. Junipers (*J. occidentalis*) and Nut-pines cover a few of the highest points, while a little lower the Yucca tree (*Y. baccata*) forms extensive groves. Many species of Cactaceæ, and other desert plants, form the most characteristic vegetation elsewhere.

In such a region the higher animals cannot be expected to abound, and those found are chiefly stragglers from more favored tracts, but still there are some of much interest. Descending the eastern slope we find Harris's Squirrel (*Spermophilus Harrisii*) scarce at this cold season, but common on our return in June. This little animal has much the appearance and habits of Tamias, but is nearly white. I saw also tracks of the Sage Fowl (*Centrocercus urophasianus*) corresponding in color with the granite rocks among which it lives, and have seen a specimen killed near here.

The only peculiar bird known is Leconte's Mock-thrush (*Harporhynchus Lecontei*), which is also of a pale grayish brown, like a faded specimen of the coast species (*H. rediviva*), but is admirably colored for concealment among the thorny bushes growing on the sand-hills it inhabits. Both of these animals having dark colored representatives in less barren regions, offer excellent instances of the influence of "natural selection," but have some peculiarities not to be explained by the influence of the climate and country they inhabit.

The road for nearly one hundred miles eastward follows the Mojave River, which, being permanent for half that distance, and supplying moisture to a narrow tract of bottom-land, forms a sort of oasis in the desert, cultivable, and with its upper parts lined with trees and shrubs. Some of the common Californian birds were rather frequent here, but I found none of interest at that season. On returning in June I found here the Purple-throat Humming Bird, the Little Vireo, and various other summer species. Fresh water shells of the genera *Lymnea*, *Physa* and *Planorbis* occurred, also two species of *Succinea*, in the more elevated cool parts of the valley.

It is in the class of reptiles, and especially lizards, that the fauna of the desert excels. Although none were visible in December, and I had not time to collect many on my return in June, I have ascertained that seventeen species have

been obtained chiefly in this region by various naturalists, principally those of the Mexican Boundary and Pacific Railroad Surveys. One which they seem to have overlooked, although the most remarkable, perhaps, because inhabiting such a desert region, I described, after my return, as Agassiz's Land-tortoise (*Xerobates Agassizii*). In size it is about equal to the species of the Gulf Coast, but differs in color and other particulars. The Indians hunt for them on the mountains among cacti and other fleshy-leaved plants, on which they probably feed, rarely or never descending to the valleys. A Water-turtle (*Actinemys marmorata*) also lives in the Mojave River. One small Cyprinoid fish (*Algansea formosa*) has been found by Dr. Heermann in this stream.

Towards the sink, or "Soda Lake," which rarely contains water, the sand becomes very dry and almost bare of vegetation. A few trees (*Chilopsis linearis*) of small size grow there, and among them I saw a flock of the Arctic Bluebird (*Sialia arctica*). The only other bird of interest seen east of this was the pretty Black-throated Finch (*Poospiza bilineata*), which is pretty common in the shrubby tracts.

HINTS ON TAXIDERMY.

BY C. A. WALKER.

[Continued from page 186.]

The method of collecting, preserving, and mounting birds. The first specimen procured, however imperfect, should always be preserved until a better one can be obtained. As soon as a bird has been killed, the following directions should be carefully observed. Fill the mouth, throat, nostrils and vent with cotton; also any shot holes which may be discovered. If there is any fresh blood upon the feathers,

sprinkle the spots with dust, sand, powdered chalk, or any other similar substances. These precautions being observed, all stains caused by blood or internal secretions will be prevented.

A paper tunnel should now be made in the same manner as those used by grocers, the bird placed in it with the head towards the point, and the upper part folded over and fixed in this position by means of a pin, taking care not to injure the tail feathers by bending or displacing them. The parcel should then be placed in a box, sufficiently large to accommodate it without crowding, and the remaining space filled with grass, paper, or any substance more easily obtained; this will prevent the specimen from being injured by friction. In our own portion of the country during the colder seasons, also in the more northern latitudes, a bird may be allowed to remain (in extreme cases) forty-eight hours before the operation of skinning is undertaken, but half the time is a safer rule. In the summer season it may be permitted to lie until the blood has coagulated and the limbs have stiffened; but in all tropical countries the operation cannot be effected with too great dispatch. If the specimen is allowed to remain any length of time beyond that above stated, the feathers about the head and abdomen are apt to fall off, thus rendering it more difficult to remove the skin; and the specimen often becomes unfit for preservation. Before skinning a bird, particular attention should be given to the color of the eyes, bill and legs, because these parts are liable to lose their tints after life is extinct, the color of the feathers upon the various parts of the body. Measurements should also be taken after the following manner, in feet, inches and fractions of an inch:

Total length from the tip of the bill to the end of the tail, the neck being stretched out in a straight line; length of the primary quills of the wing; total length of the bill, measuring either from the feathers on the forehead, following the curve of the ridge down to the tip, or from the angle of

the mouth in a straight line to the tip; the length of the tail feathers from the extremity to their insertion in the coccyx, together with their number; the length of the tarsus, from the centre of the metatarsal and tarsal joints; length of toes; length and general character of the nails; the distance between the tips of the wings when spread out to their full extent. It should be next observed whether it be male or female, young or adult; also, any change of plumage in winter or summer; the common name given it in the locality where it was collected; the exact date when it was killed, and every fact which can be ascertained concerning its habits. "The sex of the specimen may be ascertained after the operation of skinning has been completed, by making an incision in the side, near the vertebræ, and exposing the inner surface of the 'small of the back.' The generative organs will be found tightly bound to this region (nearly opposite to the last ribs), and separating it from the intestines. The testicles of the male are two spheroidal or ellipsoidal whitish bodies, varying from the size of a pin head to that of a hazel-nut, according to the season. The ovaries of the female, consisting of a flattened mass of spheres, variable in size with the season, will be found in the same region."* All of the above statements should be plainly written upon slips of parchment or pasteboard, with ink, and attached to the corresponding specimen, or recorded in a blank book, with a number corresponding to the one attached to the specimen.

When practicable, nests and eggs should be preserved with the birds to which they belong, and all information concerning dates and places where they were found. Drawings of specimens will also be useful, both in mounting and as a source of reference. Many may consider the above directions, or at least a greater portion of them, of not much importance, but if they are carefully observed and practiced, the value of the collection will be greatly enhanced, since such information is of the utmost importance in scien-

* Report of the Smithsonian Institution.

tific researches. Even should they not be destined for these purposes, the amateur will find his collection rendered far more interesting and instructive.

The collector should be provided with a light double-barrelled gun, the best of powder, and shot of various sizes, No. 10 being used for killing small birds, as it is least injurious to the plumage. Humming Birds should be killed with dust shot. Early in the morning and after sunset are the best periods of the day for procuring birds. If the collector be in any tropical country, he should choose early dawn for his excursions, on account of the coolness of the air. It is also the time when the birds are seen and heard in greatest numbers. Birds in tropical countries are generally so tame, that they can be easily approached and with little skill; a sufficient number can be killed in the space of two or three hours, to occupy the collector during the remainder of the day. It is a good rule *never to kill more specimens than can be preserved during the day.* In some parts of tropical America, Humming Birds, Creepers, and other small birds are shot with blow-pipes by the natives, and they are killed in this manner without the least injury to their plumage. Many are also caught by means of birdlime, and in springes, and specimens secured by these means are the best for preservation.

The method of skinning a bird.—One of the most important points of taxidermy, is a correct knowledge of the method of skinning a bird, so that when the operation is finished, the skin may be as perfect as possible and free from all stains. It is impossible for any one to mount a specimen neatly and artistically, from a soiled or mutilated skin. There are many instances, however, in which it may be necessary to mount poor skins from their rarity; these should never be rejected, for a specimen badly stuffed is better than none at all, and will answer until a more perfect one can be obtained. There are two things essential to success, viz., patience and practice; and a good store of both will enable

one to perform the operation with ease and dispatch. Care should always be taken not to stretch the skin, in order that its natural dimensions may be preserved.

Before proceeding to work, provide yourself with a cup of Indian-meal, cotton, needle and thread, scalpel and preservative. In the first place examine the bird, and if any spots of blood be discovered, sprinkle them with Indian-meal, and rub it back and forth with the fingers, supplying fresh meal from time to time; this will remove it entirely. If the blood be dry, apply a little warm water with a sponge, and wash the spot gently. In this manner I have cleaned the entire breast of a bird stained with blood. If any of the feathers are bent, they may be restored to position by immersing them in warm water. Remove the cotton from the mouth, nostrils and vent, and replace it with fresh stuffing. A piece of small but strong twine should now be passed from one nostril through the other on the opposite side, and bringing the ends downward tie them beneath the lower mandible, leaving them a little longer than the neck of the bird. This will aid the operator in turning the head back to its natural position after the operation of skinning has been finished. Now take an accurate measurement from the tip of the bill to the end of the tail; also the girth of the body behind the wings. The bird is then ready for the operation. Placing it upon its back with the tail turned towards your right hand, with the left separate the feathers from the lower extremity of the breastbone, quite down to the vent, laying them to the right and left so that the skin beneath is visible. Place the scalpel upon the lower tip of the breastbone and cut the skin from this point in a straight line to the vent, taking care not to sever the thin muscular tissue which covers the intestines; should this have become accidentally cut, thereby exposing the intestines, remove them at once, that they may not soil the feathers. The skin must now be separated from the flesh on either side of the incision by passing the flat portion of the scalpel handle be-

tween the skin and the body. It will be found that some birds have the skin bound much closer to the flesh than others by means of small ligaments; these must be severed with the scalpel. When the skin is loosened from its attachments quite down to the back, and the thigh laid bare, the latter should then be pressed inward and the skin turned back, in order that the leg may be separated from the body at the second joint, or the junction of the tibia with the fibula. Repeat the operation with the other side. Next, the rump, or that part into which the tail feathers are fixed, should be severed from the body at the junction of the last dorsal vertebra with the coccyx, taking care not to cut the skin upon the back. Should blood at any time be discovered, absorb it with Indian-meal, and the oily matter proceeding from the fat (which is to be especially avoided in all the marine species) may be absorbed with a little powdered chalk. If the bird is a large one, it may be now suspended by means of a large fish-hook with the barb filed off, and attached to a strong cord, which will aid greatly in removing the remaining part of the skin; but if it is a small one, it should be placed upright upon its breast, with the head lying backward. In this position the skin should be removed from the back and breast, by using the back of the scalpel as stated before, until the wings are reached upon both sides. These are to be severed from the body at the shoulder-joint. It will be found to be much easier to unjoint them by cutting beneath instead of above the joint. The neck having been reached, must be turned out until the back part of the skull is laid bare. Having separated the cervical vertebræ, or the vertebræ of the neck, close to the head, remove the ear by separating the thin skin by which it is bound to the ear-socket, being cautious not to injure it by tearing or cutting. By close examination it will be seen that the eyelid is bound to the edge of the socket by a thin skin; this should be completely severed, thereby freeing the lid from its attachments. The eyes

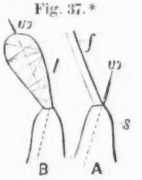
may then be removed by passing the blade of the scalpel beneath the ball and severing the optic nerve, endeavoring not to burst the former, as the humors contained within would then ooze out, and flowing through the eyelids, soil the feathers upon the head. Next cut away the tongue, together with the flesh beneath the mandibles and upon the various parts of the head, and through an opening made in the lower part of the skull carefully remove the brain. It is well to remark here that the heads of some birds are so large in comparison with the neck, as to render it impossible for the head to be turned out in the ordinary way without stretching the skin. In this case the vertebræ of the neck should be separated close to the skull, the body taken out and laid aside, and the head pulled back into its natural position. An incision is then made through the skin upon the back of the head, large enough to permit the passage of the skull, and this should then be cleaned in the same manner as stated above. Ducks, woodpeckers, flamingoes, macaws, etc., come under this rule. After the preservative has been applied to every part, and the cavities of the brain and eye filled with cotton, restore it to position, being careful to sew up the incision neatly. The wings should next be turned out, exposing two joints. The humerus may then be removed, but the double bone, consisting of the radius and the ulna, should be carefully cleaned and allowed to remain. Many taxidermists prefer to have all the bones left in their places. This, I think, should be a rule in preparing dried skins, as the wings retain their position better; but when a skin is to be mounted at once, I remove the humerus, and then find it much easier to set them. It is also a practice with many, in lieu of turning the wings, to make a longitudinal incision beneath the wing, running the length of the two first joints, and through this to remove the flesh. Lastly, the legs should be skinned, removing all the flesh, and leaving in the fibula or thigh bone. If the skin is to be mounted at once, anoint it thoroughly with powdered arsenic ap-

plied with the sifter; but if not, use the arsenical soap, because it can then be softened more readily when required for mounting. Fill the eye-sockets and cavity of the skull with cotton. Restore the leg and wing bones to position. To accomplish the latter, take hold of the tips of each, and pulling them from each other, they will easily slip into place. In turning the head back, take hold of the twine which is fastened to the bill, pulling it gently and steadily, working with the fingers when necessary, taking great care not to stretch or tear the skin of the neck. Smooth the feathers upon the various parts of the skin, and the specimen is ready for mounting.

The method of mounting a bird.—Having furnished yourself with tow, cotton, needle and thread, annealed iron wire of a size proportionate to that of the bird to be mounted, and the necessary instruments, including the large and small forceps, file, pincers, wire cutters, scissors, etc., proceed to cut fine a quantity of tow sufficient to fill the neck. With the long forceps seize a small bunch of this and insert it up through the neck and deposit it under the bill; in this manner fill from beneath the lower mandible down to the breast taking care not to insert too much stuffing or to place it unevenly. Next cut three pieces of wire; one a third longer than the total length of the body, for the main support, the other two three inches longer than the united length of the *tarsus* and *fibula*, for the leg supports; also four smaller ones five inches in length, for setting the wings and winding purposes. Sharpen each of these with the file to a fine point. Take the longest piece and bend in it three small rings, the distance between the two outer ones representing the length of the carcass of the bird, leaving one long and one short end, in the same manner as recommended in stuffing small quadrupeds. Tow should be wound about the end containing the rings, and moulded into the natural form of the body. This being completed, place the longest projecting end within the skin at the base of the neck stuffing,

and holding the head of the bird in the left hand, letting the skin hang down, with the right, insert it up through the cut tow within the neck, and thence through the top of the skull. Care must be taken not to push too hard, for by so doing you may displace the stuffing, but rather twirl the wire between the thumb and forefinger, when it will be found to penetrate easily. The skin must then be drawn over the artificial body, and the leg wires placed in position. The latter is done by placing the pointed end upon the sole of the foot, and forcing it up through the tarsus, between the skin and the bone, until the point has reached the first joint. The leg bones should then be turned out again, when the wire will appear as in Fig. 37 A, *w*. It should then be forced up a little above the top of the fibula, and cotton wound about both. This should be made to resemble the form of the flesh, which has been removed, and bound about with thread to prevent it from slipping (Fig. 37 B, *l*). The whole may then be turned back into its proper place. Now hold the protruding point against the side of the artificial body, about midway between the extremities, and force the wire through transversely, until it appears upon the opposite side, care being taken not to penetrate the skin. The end should be bent into the form of a hook, when, by taking hold of the protruding wire at the sole of the foot, and pulling it towards yourself, the hook will be firmly fastened into the body. The incision should now be closed up, by bringing the edges of the skin together, and made fast in this position with common pins; with ducks and larger birds it is necessary to sew up the lips of the incision. The legs are next brought towards each other, bending the wires close to the body until they are parallel. The joint of the fibula and tarsus should also be imitated. The bird is now ready to place upon a pedestal. All perching and climbing species should be mounted upon stands formed like the letter T; the

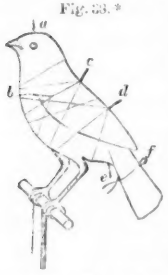
Fig. 37.*



*s, skin; *f*, fibula; *w*, wire; *l*, artificial leg.

waders, swimmers, and all other species which frequent the land or water, ought to be placed upon flat pieces of board.

Fig. 53.*



The neck can now be bent into position, and the head directed either to the front or side, according to the taste of the operator. The wings are next raised up, and placed against the sides of the body, in the same position as when the bird was living, and fastened in place by means of the short wires forced through the shoulder into the body (Fig. 38, *b*). The tail is supported by means of a wire inserted beneath the tail feathers and passed into the body (*e*).

In placing birds in certain positions, it is necessary to spread the tail feathers. This may be accomplished in a variety of ways. First, by running a small pointed wire through the shaft of every feather; this method, however, is not applicable to very small birds. Another is to take a piece of cardboard, somewhat longer than the width of the tail spread out to its full extent, and cut a horizontal slit in it of the required length; the feathers are inserted in the slit, and are retained in whatever position they have been placed. This method is practiced only upon small birds. A third method is to take a piece of wire of small size and bend it double, pressing the bent end firmly together with the pincers; the tail feathers are then arranged between the two, that is with one wire above and the other beneath them. The two loose ends are then brought together and twisted to prevent them from springing apart; also to hold the feathers more firmly (Fig. 38, *f*). The latter method is applicable to birds of any size. The two remaining short wires should next be inserted into the body, one upon the back just below the curve of the neck, the other above the rump (*c* and *d*). These are used for convenience in winding, and can be removed after the specimen is dry. The feathers should be

*a, head wire; *c* and *d*, back wires; *b*, wing support; *e*, tail support; *f*, tail spreader.

placed each in its proper place by means of the small forceps. If the eyes are not sufficiently plump a little cotton can be inserted through the eyelids, with a small quantity of putty, by which the glass eyes will be more firmly fixed; the latter operation should receive much care, the eye should have its natural fulness, and the eyelids should be well rounded. The bird should then be bound with thread, wound about the various protruding wires. This operation is done to keep the feathers in place until they are firmly fixed. A bird should not be allowed to *dry* too quickly, as the skin is then liable to shrink, but it should be placed in some *dry* place, not too warm, where the skin can gradually stiffen. When *dry* remove the thread, pull out the wires upon the back, and with the wire cutters, clip off the remainder close to the body. To insure success, the taxidermist should have a correct knowledge of the habits of birds, that he may place his subject in a position characteristic of the species. The measures previously taken will aid in securing accuracy of form.

Taxidermists, as a general thing, are apt to overstuff their specimens, and the beginner should strive to avoid this. There are several attitudes assumed by birds in the living state, which can be copied with advantage. To represent a bird in the flying position, its wings should be extended as far as possible, the tail placed horizontal and well expanded, the neck stretched forward and the legs drawn up close to the breast, with the toes closed. The wings may be spread by means of pointed wires inserted from the inside of the body, up through the wings beneath the skin, as far as the carpus, or fore arm. The wire can also be inserted from the outside near the joint of the carpus, and be forced down the wing between the skin and the bone, and thence transversely through the artificial body, into which it is fastened by means of a hook. These wires should be inserted before the leg wires are placed in position, and hooked into the artificial body, as in the former case. An interesting atti-

tude is when a bird is about to take flight. In this position the body should incline forward, and the wings be slightly raised; this can be accomplished by means of external wires placed beneath them, which are allowed to remain until the bird is dry. The moment of alarm is a striking position. To express this, the one foot must be stretched forward and the other drawn up near the body, and considerably bent. The body must be thrown to one side, with the wing on that side much elevated and spread out, while the other is placed lower and less diffuse; the tail must be expanded, thrown down at the point, and much arched; the neck should be stretched upward, and the head inclined towards the foot, which is drawn up; the eyelid should also be well rounded. The eagle can be placed in the position of seizing its prey, with wings and tail expanded, head thrown backward and crest erect, gazing upward. The vulture should have drooping wings to portray its sluggish habits. Such descriptions are endless, and indeed needless to a student of nature in its various details.

Remarks upon preparing, relaxing, and mounting dried skins.—The bird should be skinned in the ordinary manner, leaving *all* the bones of wings in their places, and the skin thoroughly anointed with arsenical soap. The neck should then be stuffed with chopped tow or cotton to its natural dimensions. The upper points of the humeri should be tied together at a distance from each other equal to that of the same when fixed in their sockets, otherwise the distance between the shoulder joints. The skin should next be filled with cotton or tow, and the incision sewed up, the legs turned inwards, crossed, and tied in this position, with a label attached containing descriptions.

One of the most efficacious methods of relaxing dried skins, is that employed by the ingenious Mr. Bullock. A box is made of convenient size, the top of which is free to lift on and off, without hinges or fastenings. The sides, top and bottom within are lined with a coating of plaster of

Paris, two or three inches thick. When any skins are to be relaxed, fill the box with water, and in this condition allow it to stand over night; in the morning any water remaining can be poured off, and the skins placed within. The lid of the box, being grooved, will shut close, and the wooden sides will prevent evaporation from going on. The box should be set in some damp situation. In twenty-four or forty-eight hours the skins will be sufficiently soft and pliant for mounting. It is necessary before placing the skins within the box, to render the feet and the bill pliable, that these parts should be enclosed in dampened rags or tow. Before moistening, the body should be opened and the inside stuffing taken out with the forceps. Another method is to fill the skin (the former stuffing having been previously removed) with cotton or rags saturated with water, enveloping it with a damp cloth, having wrapped the bill and feet as above stated. The former is preferable, as the latter does not relax all the parts equally. In some cases, however, especially with those of the aquatic families, it is necessary to prepare them after the latter plan, and in this condition to place them in the box described above.

The general method pursued in mounting dried skins is the same as that practiced upon fresh specimens. Difficulty is often experienced in placing the leg wires in position from the dry and shrivelled condition of the tarsi; this may be overcome by perforating them with the awl used for that purpose (recommended in the former article upon mammalia) previous to inserting the wires. With many of the skins of South American birds, prepared by the natives, a proper adjustment of the wings is found to be impossible. In this case it is necessary to cut them off close to the body, and fix them anew. In replacing the wings the scapulars should be carefully arranged to effectually conceal the joining of the wings. Any feathers disarranged in the operation should be properly adjusted with the small forceps.—*To be continued.*

A FISH FARM.

BY E. DEXTER.

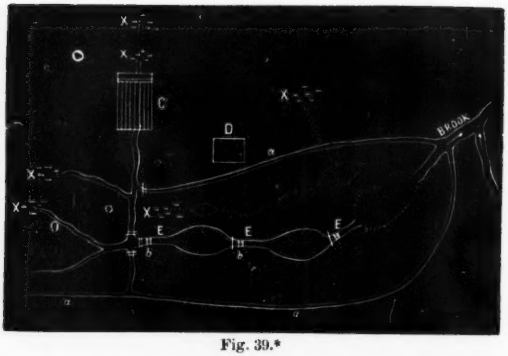


Fig. 39.*

THE Fish-hatching establishment at West Barnstable was begun in the spring of 1868. The experiments have as yet been confined mostly to trout, of which we have hatched this year some 60 000, as well as 2000 salmon ova which were procured in New Brunswick by the State Commissioners of Fisheries, by whom they were presented to us. As the process of hatching goes on during the transport of the eggs in wet moss, we lost several by their hatching on the way in the cars.

The place selected for building the ponds to contain the parent trout, was a swampy piece of land at the head of a brook of considerable size, running into the salt water after a course of a mile and a half or two miles, and containing a half dozen or more pure springs, the waters of which formed

* EXPLANATION OF FIG. 39.—X, X, X, X, X, X, springs. *a*, *a*, *a*, drains. C, hatching house. D, represents a series of ponds for young fish. E, E, E, spawning ways. *b*, *b*, plank troughs. The two ponds between E, E, E, are for spawning fish. The large pond represented by dotted lines, on the right of this, is used as a reservoir for fish. The dotted lines on the cut above the ponds represent a proposed series of ponds. A tank is also placed at this point, indicated by the X on the left of this series of proposed ponds.

the fountain head of the stream. Two ponds have thus far been made by excavation, each about forty feet long by twenty feet wide, and from three to four and a half feet deep. They are connected together, the same water being used for both ponds. The supply of water is about eighteen square inches, and is taken from tanks made of plank, varying in size from ten to fifteen feet in length, and from four to ten feet in breadth, sunk in the soft mud at the points where the springs came to the surface, and as deep as was necessary to reach the substratum of sand, which was generally about five feet. These tanks have no bottom planks, and the water wells up through the sand at the bottom, forming reservoirs of living water of even temperature, summer and winter, and not subject to freshet or variation in quantity. The temperature of the springs varies but little from 48° throughout the year.

There are now about seven hundred parent trout in the two ponds, ranging from three-quarters of a pound to three pounds in weight. It is calculated that the first pond will sustain over 2000 fish of the larger size, while in the second three times that number of smaller fish will thrive. This is allowing one large fish or three of the smaller size to the cubic foot.

They are fed daily with live minnows and shrimp caught on the adjacent salt marshes, or, when they cannot be conveniently obtained, with chopped liver, the roe of codfish, etc. The ponds are stoned, and one of them which was built in low wet land, is cemented on each side of the stones. Having learned by former experience that trout will spawn in the pond, and the ova thus be lost if its bottom is sandy or gravelly, we covered the bottom, where its nature seemed to invite the fish to this operation, with flat stones, thus obviating the difficulty so far as we have observed. Aquatic plants, mosses, etc., were introduced and now cover the bottom, not only providing a large amount of food in the form of crustacea, snails, etc., but also supplying to the water

the necessary chemical elements which are being constantly exhausted by the respiration of the fish.

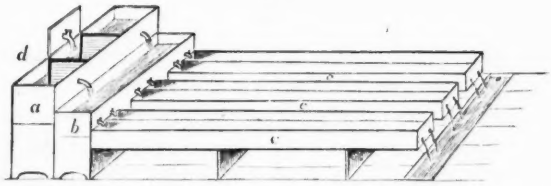
The water enters each pond through a plank trough, the sides of which are sunk nearly to the level of the ground. These troughs are fifty feet long and three and a half feet wide, and are filled to the depth of six inches with coarse gravel, over which there are six inches of water flowing with a slight current to the ponds. As it is the habit of the trout to seek shallow running streams to spawn, they eagerly resort to these *spawning ways* when ready, and are taken by closing the bottom of the way, and driving the fish into a bag net at its entrance into the pond. They are then removed in tubs of water to the *hatching house*, for the purpose of taking the ova from the female and impregnating them with the milt of the male fish. The modus operandi is as follows: The female fish is grasped with one hand by the back and shoulders, the vent being held under the surface of the water in a tin pan or other vessel partly filled, while with the other hand the abdomen is gently rubbed or pressed toward the vent. If the ova are mature and ready to be shed, a slight pressure is sufficient to extrude them. The same operation is then gone through with the male; if his milt is mature, it will flow in a small quantity into the vessel. A few drops are sufficient to impregnate thousands of eggs. The milt and the ova are then gently stirred together, and allowed to remain undisturbed for five or ten minutes. The water is then poured off, new water is gently admitted to wash the eggs, and they are ready to be placed in the hatching troughs.

It may be as well to state here that the spawning time for trout is from October till March, the principal spawning months being November and December. It is generally calculated that a trout weighing one pound will produce 1000 eggs; the larger and smaller ones in the same general proportion. I have known, however, during the past season, a trout of less than half a pound in weight, to deliver 1000 eggs by actual count.

The first requisite now is a supply of pure *spring* water for hatching the eggs,—neither too warm nor too cold. From 45° to 50° is the best. Every degree warmer or colder will make from six to eight days difference in the time of hatching. From 37° to 54° is considered the limit within which to hatch trout. By a calculation in Mr. Norris' book ("American Fish Culture"), it will take one hundred and sixty-five days with water at 37°, and thirty-two days with water at 54°.

The hatching house in the establishment we have spoken of is a wooden building twenty feet long by twelve feet

Fig. 40.



wide, into which water is admitted about three feet above the level of the floor, from springs immediately in the rear, enclosed in sunken tanks as before described, and covered so as to be out of reach of cold or heat. To enable the water to be brought in at this height from the floor, the house is sunk three feet in the ground, and the boards are covered with a heavy coat of pitch inside and out, to a point above the level of the surrounding ground to prevent their rotting. The amount of water now used in the house is what will flow through two faucets, one inch in diameter, with a moderate pressure. This is led in the first instance into a *straining trough* (Fig. 40, *a*), running across the width of the building, where it passes through flannel strainers (*d*) to insure its purity. It then flows into a *distributing trough* (*b*), which is parallel to the straining trough and a few inches lower, from which, by means of faucets, it is let on to the *hatching troughs* in such quantity as may be best.

The hatching troughs (Fig. 40, *c*) are placed at right angles to the others, and are sixteen feet long, fifteen inches wide, and eight inches deep, and are six in number with covers upon hinges, the top of them being about fifteen inches from the floor. They are lined with slate, one-half of an inch thick, upon the sides and bottom, with transverse subdivisions; every two feet made of the same material and two inches in height. A fungus growth, very detrimental to the ova, is unavoidable when wood only is used. The bottom of the troughs is covered with about one inch of moderately fine gravel, and over it flows a constant stream of screened spring water about an inch deep, the lower end of the trough being depressed two inches. On this gravel the impregnated ova are placed in a single layer. In about three weeks the eyes can be seen in the impregnated eggs, appearing simply as two black specks; the blood-vessels of the future fish may also be seen, and from this time its development may be traced daily in the shell. With the temperature of the water at 48°, we may look for the hatching of the ova from the forty-fifth to the fiftieth day. A trout just hatched is about three-eighths of an inch in length, and has attached to it an umbilical sac of several times its own bulk, which sustains the young fish for about forty days, when it is absorbed. The young fish may now be let out into the waters it is desired to stock. They will thrive if placed in a brook even at this early age, such waters supplying an abundance of minute particles of food. If reared in confinement, however, they must be fed with raw liver chopped to the consistency of blood and mixed with water, with the yolk of eggs grated very fine and treated in the same way, or thin sour curds. The latter food is perhaps the best as it sinks more slowly, and trout seize their food *in transitu*, paying little attention to it after it reaches the bottom.

We have sought only to give such a general description of a fish breeding establishment, and of the habits and treat-

ment of the fish, as would give some idea of the practical parts of the art of pisciculture. There are many details connected with the subject which we have not touched upon. They can be found very thoroughly treated of in any of the modern works on pisciculture, of which Norris' "American Fish Culture" is the latest and most practical.

In the above all general considerations have been avoided. It would, perhaps, have been as well to have stated that the arguments in favor of artificial hatching of eggs is based on the small proportion of them that are hatched when deposited in a stream, by the fish following the course of nature, and the very large proportion when hatched by artificial arrangement. The many enemies of fish spawn (other fish, water insects, birds, rats, not to speak of sediment, freshets, ice, etc., etc.) reduce the number of the eggs sadly. It has been calculated by English pisciculturalists that not one salmon reaches the proper size for the table out of every thousand eggs deposited in the stream. As the salmon migrates to the sea when weighing only a few ounces, it would, however, be more subject to casualty than the trout.

THE FRESH-WATER AQUARIUM.

BY C. B. BRIGHAM.

(Continued from page 136.)

We have seen that the aquarium is to be distinguished from the common fish-globe by its self-supporting character. We have examined in a general way the philosophy of the aquarium and concluded that the rectangular tank was the most useful one to have. Let us now look for a situation for the tank before the specimens are placed within it. It is desirable that the sun should shine upon the tank for at least an hour during the day; an eastern or southern aspect

then is the best for this purpose. This is especially true in the winter time, while in summer a northern aspect would be preferred, as the water in the aquarium is apt to be overheated by the sun during the hot months. One trouble which arises from too much sun is this: that the small green plants of conferva grow very rapidly upon the glass and stones, obstructing the view of the inside of the tank, and rendering the stones very hard to clean when taken out. These confervæ do not injure the water at all; they even give out oxygen as other plants, and it seems as if it were a provision of nature, that they should render the glass opaque so as to protect the inmates of the tank from injury. This confervoid growth is not essential to the welfare of the tank if it is properly stocked with other plants, and it is desirable to have as little as possible of it. To effect this, a wide screen, or a simple sheet of brown paper, so placed as to shut out the sunlight from the tank will answer the purpose; or by pulling the window shade down when the sun shines upon the tank; or, what is best, by placing a row of plants with full foliage between the tank and the window, we have other means of obviating the difficulty.

Whether the sun shines upon the tank or not, a fresh-water aquarium should have all the daylight it can get, both for its own welfare and for our own convenience in examination. I am convinced that this is correct from my own experience, although Mr. Hibberd, a good authority on aquarial matters, says to the contrary: "A full flood of daylight is more harm than good, a frequency of sunshine destructive, and the tenants of an aquarium are seen to better advantage in a vessel lighted from above only." Before any specimens are introduced into the tank, it should be thoroughly washed out and the glass cleaned on all sides, as this is the only time when it can be done to advantage. We are sure then that no impurity of any kind will thus far hinder the success of the aquarium. The tank then is ready for the rock-work. This rock-work is useful: first, as a shelter for the animals, some

of them being averse to the light if it is strong; second, as a means of concealing the sediment which, without doing any material injury, so mars the beauty of an aquarium; third, as a means for anchoring in their proper place the plants we put in; fourth, and lastly, to make the effect of the aquarium more like nature.

It is generally thought that most water-plants, to do well in an aquarium, must have soil to grow in as well as land-plants, and that a layer of earth or sand must be spread over the bottom of the tank for the roots; this is found by experience to be a mistake. No earth nor sand is required for the plants which grow best in the aquarium. Either is very apt to spoil the water after remaining in contact with it a short time. Coarse sand is, to be sure, sometimes used when we have animals in the tank whose nature it is to burrow, but even then only in a small quantity placed near a corner of the tank. Some of the small lilies grow better if they have a cubic inch of peat attached to their roots. This small quantity does not injure the water, however long it may remain in it, and is often very useful. In general, however, if the plants are placed right side up, among small stones about the size of a fresh pea, they will grow to any extent, seldom throwing out roots of any kind.

We want, then, a layer of small stones on the bottom, about an inch in thickness; this will be sufficient to bury the ends of the plants in, and to conceal all the sediment which may collect, at the same time giving depth enough for the mussels to burrow in. The stones used with tar for the tops of houses are about the right size for this layer, and on the top of it some larger stones about the size of an almond may be scattered here and there. As to the color of the stones this may add greatly to the effect. If we can have the patience to pick out for ourselves the white and variegated stones from the beaches, we shall be amply repaid by their appearance in water. White stones give a brighter look to the inside of the tank than dark-colored ones, and

they show off the green plants much better; but they also show the green confervoid growths growing upon them much sooner than dark stones, and are much harder to clean after they have once become green. This difficulty of cleaning can be remedied by having two sets of stones, one being buried in damp sand while the other is in use. Were the beautiful stones of almost fabulous brilliancy which cover the San Mateo beach, near San Francisco, as common on our shores, we should have a famous groundwork for the aquarium. After the layer of small stones has been evenly spread upon the bottom of the tank, we may arrange the rock-work in the centre in the following way, which seems to be a good one, because by it we avoid using cement, which makes a tank look altogether too artificial, and we get a strong piece of work giving sufficient shelter to the animals, and one that will not be likely to fall down and injure the glass of the tank. It consists, essentially, of a series of three stone bridges, the one above being smaller than the one below. If the tank is small one or two bridges may be all sufficient. We take then two or more pieces of stone, having very rough edges so as to look more natural, and place them about a foot apart if the tank will admit of such a width, making a height of about two inches. Upon the tops of these pillars of support we place a thin flat stone, large enough to rest firmly on them, and even lap over an inch or so on each side; then upon this flat stone we place the pillars of another bridge, having the next flat stone somewhat smaller than the other, and so on until we have made so many bridges that the top one will just rest upon the surface of the water. The distance between these flat stones may vary according to the fancy of the builder. The top stone makes a little island, and gives a chance for such animals as tritons and turtles to come out and sun themselves or take the air. Another use which this top stone may be put to is this,—to support a small collection of marsh plants, making a great ornament to the aquarium.

Many of the fern-like mosses found growing on the rocks in damp places in the woods, or the swamp cowslips or violets, or the delicate plants of sundew (*Drosera rotundifolia*), or some of the kinds of arrowheads (*Sagittaria*), do perfectly well if planted in a very small quantity of soil upon this top stone. Our native pitcher plant (*Sarracenia purpurea*), and the red cardinal plant (*Lobelia cardinalis*), seem especially adapted for this purpose. If we take the former plant up in the fall and keep it growing upon the top stone until March, it will then begin to throw out its buds, and, before long, blossom most curiously. The latter plant seems to do best when taken up with the buds just appearing, and it will last long enough in flower to repay one for all the trouble of transplanting it. Various other means of beautifying the top stone may be adopted. If we wish a small collection of tropical ferns, and have room enough, we may cover them with a glass shade and have a diminutive Wardian-case, forming a part of the aquarium.

It is the custom with many to make a mound of marine-shells, or of coral, in the centre of the tank; besides being dangerous to the water from the difficulty of getting them perfectly clean, they seem quite out of place, not only because they are foreign to fresh water, but because it seems that the aquarium should be a place for living, not for dead specimens. It is far better to avoid putting in any shells, however beautiful they may be in the cabinet. Having completed the rock-work, and washed every stone carefully as it is put in, the plants are next to be attended to. In fresh-water plants we have for the most part to deal with the different shades of green, while in salt-water plants the colors are varied and brilliant. There is, however, this advantage in fresh-water plants, that almost all of them will grow well in a properly managed aquarium, while only the very green ones of the salt-water plants are likely to flourish under the same conditions. One great drawback to the growth of aquarial plants is the change of the water from a higher to a

lower temperature, or the reverse. It is also sometimes found difficult to grow several kinds in one tank successfully. The common water-cress (*Nasturtium officinale*), for example, found mostly in cold springs and their brooks, will do well with water starwort (*Callitriche verna*), a plant growing in a similar situation, if the water in the tank is kept at a low temperature; but at a moderately high one grows long and rank, and finally decays. So again many plants which grow in brooks or rivers, and have become accustomed to be constantly moved by a current, when placed in the still water of an aquarium inevitably mould away. — *To be continued.*

REVIEWS.

The Butterflies of New England. — The notice in our last number of Mr. Scudder's promised work on New England Butterflies, has already brought many welcome responses. A number of living butterflies have been sent in cotton wool, and although a day upon their journey, were received alive and in good condition; those who live near Boston might try this method, but we think that most persons would be interested in raising the larvæ themselves. In attempting to obtain eggs for this purpose, it is better not to select the freshest butterflies, as their eggs will often prove undeveloped, or at least unimpregnated. It should also be remembered that the males usually appear about a week before the females, and experiments would therefore be more likely to succeed if made about a fortnight after the species is first observed. The following butterflies can be experimented upon by the time these lines meet the reader's eye: — *Pieris oleracea, rapæ* and *Protodice; Colias Philodice; Anthocaris Genutia; Chrysophanus Americanus; Lycæna Lucia* and *Comyntas; Thecla Auburniana, Niphon, Augustus* and *Henrici; Argynnis Bellona; Pyrameis cardui, Huntera* and *Atalanta; Vanessa Milberti* and *interrogationis*, and *Hesperia Massasoit, Quadaquina, Pocahontas, Metea* and others. The following species, the earlier stages of which are unknown, probably feed on the plants specified: — *Anthocaris Genutia* on cruciferous plants; *Lycæna Lucia* on buckthorn; *Thecla Auburniana* on smilax; *T. Niphon* on pine; *T. Augustus* and *Henrici* on vaccinium; *Argynnis Bellona* on violets or raspberry; and the different species of *Hesperia* on poplar, scrub oak, clover, grasses and various herbaceous plants.

In answer to repeated enquiries, we will state that the males of butterflies may, in general, be distinguished from the females by a series of clasping hooks which protrude from the orifice at the tip of the abdomen; frequently these are effectually concealed by long scales. In a number of families the sexes can be determined by the partially undeveloped condition of the front legs of the male; collectors also know many species by their colors.

The proposed volume will include a history and description of the parasites of butterflies. Dr. Packard has kindly promised his assistance in describing these parasites, and examples of every kind, and in large numbers are desired. They should be accompanied by specimens of the species infested, and if possible, by such as show the mode of attack; the fullest observations on the time and manner of attack, and on the subsequent life of the insects will be acceptable. All specimens will be returned, when desired, by the end of the year.

Complete lists of the butterflies found in different localities, both in New England and the adjacent regions, are wanted, and especially if accompanied by careful memoranda of the exact times of the first appearance, and of the duration of each species. It will be necessary to receive insects from every possible quarter to arrive at a definite knowledge of their habits. To secure this more effectually, Mr. Scudder will name any local collection of butterflies sent to him with notes, at the Boston Society of Natural History, about the first of October; such collections would be returned before the first of January. For the safety, however, of his own collection, and of others entrusted to him, it will be necessary to return at once, unnamed, any collection showing traces of having been previously attacked by museum pests.

As stated last month, the amplest credit will be given in the work for every item of scientific intelligence received. We urge our readers to assist in this undertaking to the extent of their ability. With such material aid, the volume cannot fail to supply a need which has long been felt.

Monograph of the Trichopterygidæ.—Rev. A. Matthews, Market Harborough, England, is preparing an elaborate monograph of this family of Coleoptera. It will be illustrated by dissections of all the genera, which Mr. M. has made in a manner heretofore unapproached, and by figures of all the species. The style of the work may be somewhat appreciated by reference to his description and figure of *Limulinus paradoxus*, in the Annals of the Lyceum of Natural History, New York, VIII, p. 406, pl. 15.

Many new species from the United States will be figured and described in this work, which will be indispensable to the library of all learned societies which cultivate the science of entomology, and to the private libraries of investigating coleopterologists.

Persons who desire to subscribe will please order the work through any importing bookseller, and send their names to me that I may inform

the author what number of copies will be required for this country. The price will be £1.

This monograph will be executed in the best style, and we hope that a liberal subscription may be made, to diminish for the author the cost of publication. — J. L. LECONTE, *Philadelphia, Pa.*

INSECTS INJURIOUS TO FOREST TREES. — Prof. Ratzburg has published a new edition of the "Waldverderber und ihre Feinde" (Insects, etc., injurious to Forests, and their Enemies. Berlin, 1869. pp. 457, with plates, $4.50 gold).*

He has also published a new work of great value: "Die Waldverderbniss," etc. Berlin, 1868–'69. 4to, two vols., $17.00 gold, with many plates, both zoölogical and anatomical, representing forest insects.

It is an interesting fact that in the German forests, since 1867, the Ichneumon enemies (before regularly 10 per cent. in number of the injurious insects they prey upon), suddenly became 0 per cent., while the injurious insects have increased from 40 to 50 per cent. He thus accounts by this great decrease in the number of the insect parasites for the very great loss of forest trees observed in Germany within the last fifteen years. — H. HAGEN.

REVIEW OF THE SCANDINAVIAN CONTRIBUTIONS TO NATURAL HISTORY IN 1867–8. (Continued.) Sweden and Finland. By Dr. C. F. Lütken. — Many of the scientific men of Sweden have of late years been occupied by the examination of the zoölogical, botanical and geological collections brought home to Stockholm by the various exploring expeditions to Spitzberg, executed with admirable skill, energy and endurance, by several of the youngest Swedish and Finnish naturalists, under the superintendence of the Royal Swedish Academy, and the special leading and patronage of S. Lovén, and with liberal grants from the State funds. Sweden has generously taken upon itself the task of enriching science with a thorough knowledge of this most Arctic country, of its mathematical and physical geography, geology, terrestrial and marine flora and fauna, with the purpose of obtaining in this way a solid base for all the important investigations and discussions dependent on a complete knowledge of Arctic nature. In Malmgren's appendix to the "Report of the Swedish expedition to Spitzbergen in 1864," you will find a complete list of all the publications relating to the scientific investigations of this country. Many of these papers are inserted in the "Proceedings of the Swedish Academy," for 1866–68. Among the most important, I must first name Dr. Malmgren's *Annulata polychæta Spitsbergiæ, Grönlandiæ, Islandiæ et Scandinaviæ usque cognita*, a most important work, giving (with the author's previous work, "Northern Marine Annulata," published in the same periodical) a complete synopsis of all the chætopodous worms of our northern seas, with numerous descriptions of new genera and species, and many plates. Of like importance is Dr. Smitt's voluminous synopsis of the Arctic and boreal Bryozoa, which contains an enormous

* These works will be imported by the Naturalist's Book Agency at the above prices in gold.

and astonishing mass of learning and research, and has established, I believe, this part of zoögraphy on quite a new base. A profound study of the monograph is indispensable to every one who may in the future devote himself to this group; but whether all the peculiar views and conclusions advocated by Dr. Smitt will be finally adopted, is a question I am not qualified to discuss. Prof. Andersson has described a new grass (*Colpodium Malmgreni*). Dr. Cleve has reviewed the Diatomaceæ, and Dr. Lindberg the mosses of Spitzberg, while Prof. Heer* has examined the fossil (miocene) plants of Spitzberg and Walrussia, and Dr. Lindström has analyzed some of the rocks of Spitzberg. But besides these efforts of a more special character have been made the unceasing endeavors characteristic of the pupils of Linnæus, to clear up the fauna, flora, and mineral wealth of Sweden itself. I cannot here enumerate all the papers relating to this subject, but will only state that you will find several local faunas and floras, as well as special or local lists of peculiar classes of plants or animals, *i. e.*, of the fishes of Finmarken, with many critical notes by Malmgren; of the lichens of various provinces; of the Diatomaceæ of Sweden and Norway; of the birds of Sweden by Meves; various faunal, entomological and chemical researches on rare or little known Swedish minerals, etc. Among papers of a wider scope I must cite the continuation of Prof. Kinberg's "Characteristics of Annulata" collected during the voyage of the "Eugenie," a sort of prodromus of the elaborate descriptions to be given in the report of that voyage, published by the Academy; many new genera and species are established among the Amphinomeæ (the other higher groups were treated in previous volumes); and among the limivorous and sanguivorous divisions. To this series of papers also belongs Kinberg's curious observations of an annelid (*Lycaretus*), reproducing its head and anterior body segments. Prof. Kinberg has also published a paper on the "Origin of the second cervical Vertebra (*epistrophæus*) in Mammals, through the fusion together of two Vertebræ." In Mammalia, generally, the odontoid process is separated during a longer or shorter period, from the true *corpus epistrophæi* by two intervertebral epiphyses in the same manner as in all other ordinary distinct vertebræ; the odontoid process has parts answering to the arms, which are, however, not developed into true arches, but analogous to that of certain caudal vertebræ; the epistrophæus has of course two corpora fused together like the sacral vertebræ, and consequently draws its origin from the connection of two primordial vertebræ. Prof. Staal's (the Entomological Curator of the State Museum, in Stockholm) critical and diagnostical review of the Hemiptera (Reduviadæ, Hydrobatidæ, Saldæ, etc.) will, I do not doubt, add to the author's high reputation for accuracy and acumen, and might the more be recommended to the attention of American entomologists, since many American bugs are reviewed in these papers, which, written in Latin, are quite accessible to men of all

*A more detailed account is to be found in Prof. Heer's great work, "Flora fossilis Arctica," dependent principally on materials brought together by Scandinavian travellers and naturalists, and deposited in the museums of Copenhagen and Stockholm.

nations. Dr. Ljungman's descriptions of new Ophiuridæ, and his useful synopsis of all the known genera and species, with several new forms of both categories should next be noticed. Also Prof. Lovén's description of a new genus (or subgenus?) of Crinoids of the Antedon tribe (*Phanogenia typica*) from India. His description of *Leskia mirabilis*, confirming the presence of the valvulate peristome and periproct ascribed to this curious genus of Spatangidæ (*Paleostomata* Lovén) by Gray, and suggesting an interesting analogy with the Cystideæ, elucidated by some very valuable observations upon the structure of this ancient type (*vide* the Geological Magazine* for a more detailed account of this paper), and lastly but not least, the same celebrated author's ingenious memoir on the little stalked pyriform deep-sea sponge, from Finmarken, termed *Hyalonema boreale* Lovén, by means of which he demonstrated that the Lusitanian and Japanese Glass-ropes had hitherto been erroneously represented as if turned upside down.† (The paper is translated fully in the Annals and Magazine of Natural History.) Dr. Lindström has described a new species of the brachiopodous genus Trimerella, from the Silurian limestone of Gotland, and added some important features to the knowledge of this singular genus. He has also continued his valuable observations on the Silurian "corals" of that island, with the description of a new and supposed *true* coral (*Calocystis cribraria*), of the tribe *Eupsammidæ* (?), from that remote epoch, and a new *operculated* species of Cystiphyllum. Dr. Lindström's previous discovery of true operculata in several Cyathophylloid corals had apparently widened the gap between these ancient "Pseudo-corals" (*Anthozoa rugosa* and *tabulata*), and the true corals of later epochs, but the recent discoveries by Dr. Duncan of some presumed transitional forms between both types, and the striking analogy pointed out by Lindström between the structure of Zaphrentis and that of Cerianthus and Sphenopus, have made him change his opinions on the subject somewhat, and "operculated corals" are now, according to the opinion of Lindström, a less strange and illogical combination of characters than he formerly supposed. Finally I shall cite Dr. Thorell's interesting note on *Aranea lobata* Pallas, demonstrating its identity with *Argiope sericea* Oliv. (translated in the "Annals"); also Prof. Elias Fries' *Symbolæ ad synonymiam Hieraciorum*. Mr. Raupach's notes on the earthquake at St. Thomas, November 18, and December 11, 1867: Dr. Lindguist's interesting observations confirming the popular belief (already advocated by Aristotle as regards the stag and horse) that cows and sheep (also antelopes) have the singular custom of devouring their own afterbirth.‡ Prof. Steenberg's suggestions on the applicability of lichens to the fabrication of grape-sugar and alcohol, might perhaps also be of im-

* Reprinted, with a note by Mr. E. Billings, in the "Canadian Naturalist and Geologist," December, 1868.

† Some further knowledge of the "Hyalonema," from Santa Cruz, mentioned some years ago by Prof. Leidy, as existing in the Museum of Philadelphia, would just now be very desirable. (See Proceedings of Biological Section of Acad. Nat. Science, Phila., Oct. 5, 1868.—EDS.)

‡ We have noticed the same habit in the cat.—EDS.

portance to other northern countries, where lichens are abundant; and Mr. v. Post's observations on the so-termed "giant-kettles" (kettle-shaped excavations in rocks, with whorl-like or spiral striations, evidently produced by water-whorls turning stones around along with them) as drawing their origin from the waters rushing vertically down through local cracks in glaciers (the so-termed "moulins") throw farther light on the great glacial epoch and the monuments it left behind; no doubt also North America will furnish numerous instances of the phenomena interpreted so successfully by Mr. v. Post.

Though we are now connected by railways with the Swedish capital, I must confess that the last volume of the "Transactions of the Royal Swedish Academy of Science" which has reached us, is the sixth of the new series, or that for 1865-66; it would therefore strictly fall behind the limits of this review; but as it bears the year 1867 on the foot of the title page, I presume that some of its parts have been published so late as 1867, and I therefore shall briefly state that this volume encloses the excellent *Monographia Salicum*, by Prof. Andersson (with nine plates). One hundred and five species are described in this work by the learned author, who through many years made this genus his favorite study, and whose well deserved reputation will recommend his work to the attention of all botanists, as being that of the first authority on the subject. Mr. Zetterstedt has examined the flora of Smaland (a province of Sweden). To Durir and Nordenskjold we owe contributions to the geography of Spitzbergen (with a large and excellent chart), and a discussion on the possibility of executing a triangulation of this Arctic country, while Nordenskjold has published a geological description of it (with charts and profiles), and Lindström has described its Triassic and Jurassic fossils. Of the contents of the later volumes, if such have appeared, I am only acquainted with Dr. Paykull's (author of Travels in Iceland) geological description of Iceland (with a beautiful chart), and a paper by Mr. Malm on the structure and transformations of the *Pleuronectidæ* (flounders), wherein the author has established some facts that appear to be at variance with the explanation proposed by Steenstrup, of the migration of the eye from the lower to the upper side of the head; but as this question must yet be regarded as a partially open one, and farther contributions to its elucidation may be anticipated, I shall defer what might possibly be said on the subject to another occasion. Of the "Voyage of the Eugenie," published under the patronage of the Academy (Annulata, by Kinberg; Insecta, by Bohemann and Staal), I am not aware that anything has been published during the biennium, and the same must be said of Sundevall's unfinished "Birds of Sweden." You will find in it Prof. W. Lilljeborg's description of two subfossil whales discovered in Sweden (*Eschrichtius robustus* and *Hunterius Swedenborgii*, with eleven plates), containing also an elaborate synopsis of all known genera (or subgenera?) of "Whalebone Whales," among which the author distinguishes not less than ten generic subdivisions. As the memoir is written in English, a farther review of its contents may be unnecessary here.

Dr. Cleve has contributed a monograph of the Swedish *Zygnemaceæ* (a tribe of confervoid Algæ), illustrated by ten beautiful plates; seven genera and twenty-five species are described, and they appear (I am of course not competent to judge) to be treated of with that care and ability that one is accustomed to find in the countrymen of Linnæus. As all descriptions are translated into Latin, the paper will easily be available to all. The University of Lund has published two volumes of "*Acta Universitatis Lundensis*," for 1866 and '67. Dr. Olsson describes in full detail the *Cestoidea* and *Trematoda*, observed by himself in Scandinavian fishes; he scrutinized no less than 860 specimens of fishes, belonging to seventy-six species, and found fifty-six species of fully-developed parasitic *Platyelmintha*. Diagnoses of all the species are given in Latin, and five plates illustrate the text. Two parts are published of this work that will be indispensable to any who in America should be disposed to pursue similar studies. Dr. Quennerstedt pursues his investigations of the Swedish Infusoria, a line of research in which little or nothing has been done in Scandinavia since the time of O. Fr. Müller. Dr. Lyttkens has described the muscles, the integument and its internal portions in the Homarus (Lobster), with two plates, and in future parts will treat of the integument, etc., of Lithodes, Cancer and Pagurus. Prof. Wahlgrën has described and figured a specimen of the great Sun-fish (*Mola nasus*), and made some valuable additions to the knowledge of its anatomy. This species is the greater one of the species commonly confounded under the collective name of "*Orthagoriscus mola*," and the only one hitherto observed on the American shores of the Atlantic; while the smaller species (*M. Retzii*) is only found on the European side of the ocean, where *M. nasus*, however, is by no means uncommon; the distinctive characters were pointed out by Prof. Steenstrup and myself in 1863. Prof. Agardh has contributed a detailed monograph (in Latin) of the Laminarian Algæ, and Prof. Areschough an anatomical investigation of the leaf (with two plates). His principal conclusion is the anatomical demonstration of the fact, that the leaf is, indeed, only a metamorphosed stem (why not that the stem is, in fact, only the metamorphosed leaf); also some interesting researches on the history of the Scandinavian flora, based principally on its geographical distribution (with two charts). He points out the vestiges of three migrations, *i. e.*, that of the Arctic flora, which towards the close of the glacial epoch, migrated from Northern Siberia; the eastern and north-eastern (Altaic) element, which at a later time, after the glacial epoch and before the appearance of the *Fagus sylvestris*, wandered into Europe from Siberia (Altai); and lastly, a southern (south-eastern Caucasian) element (our common beech among the number), which at a still more recent epoch made its way into Northern Europe from the circumference of the Mediterranean, of the Black and of the Caspian Seas. Dr. Berggrën has continued his studies of the Mosses, especially on the structure and evolution of *Andreæa*. Dr. Holmström has published his researches on the glacial phenomena in Southern Sweden, illustrated by a very instructive chart, showing the direction of the ice-tracks. Dr. Lundgrën

has undertaken the critical determination and description of the petrifactions of the recently discovered Faxe-limestone in Scandinavia, while Dr. Törnkrist has studied the geological structure and chronology of the older Silurian beds in Dalarne; and Prof. Torell's description of the Scandinavian "Sparagmitis-formation,"—the oldest (Cambrian) fossiliferous layer in Scandinavia, and of its rare and highly enigmatical fossil remains, closes this very creditable series of scientific contributions published by our sister University.

Among the papers published in the "Botaniske Notiser," 1867 and '68 (edited by Prof. Th. Fries, at Upsala), I must cite Prof. Andersson's, on the genus Salix, and especially its northern species; Dr. Goës' description of the flora of the West Indian island, St. Barthélemy; Mr. Moë's valuable observations on the influence of the different mineralogical constituents of the soil upon the variation of plants; several papers on the Scandinavian species of *Callitriche*, *Juncí* and *Charex*, *Notulæ-lichenologica*, and other geodesical contributions, among which some observations on the variation of the parts of the cone in the common *Pinus abies* should be particularly noticed by botanists and palæophytologists. In every volume of this highly esteemed journal, a complete annual list is given of all botanical papers published in Sweden, Norway and Denmark.

The work of the celebrated mycologist, Elias Fries, on the edible and poisonous mushrooms of Sweden, has been finished, and a new work on the rarer species of this class is in course of publication. Of the great geological chart of Sweden, published by the State Geological Survey, under the direction of Prof. Erdmann, twenty-five sheets have appeared. The editor has also published a volume on "The Quarternary Beds of Sweden" (with fourteen charts, profiles, etc.), giving a detailed account of the glacial, post-glacial, etc., formations of this country, where these layers have, I believe, been more fully studied than elsewhere; and though I am no competent judge in this matter either, I cannot but believe that Prof. Erdmann's synopsis of the results arrived at, and the researches carried out in Sweden, must be of great importance to the geologists of all northern countries where similar formations occur. The topic of "The Glacial Epoch in Northern Europe" has also been treated of in a more popular manner by Dr. Paykull, in a special pamphlet. Dr. Lindström has published a careful and critical list of the recent and subfossil mollusca of the isle of Gotland, and discussed at length their geographical distribution beyond the narrow limits of his island; three plates with figures of teeth, jaws, etc., are added. Mr. Malm, the Curator of the Museum at Göteborg, has published the fourth and fifth parts of his "Zoölogical Observations" (reprinted from the Transactions of the Royal Society of Göteborg). Though the fourth part had been printed as early as 1863, it was not, I believe, circulated before the last year, and I shall therefore give a review of the different chapters: "a List of Marine Mollusca observed in the brackish water of Göteborg, and in the estuary of the Göta-elf;" "a Monograph of the Syrphici (a family of

Diptera) of Scandinavia and Finland"; "a Review of the Scandinavian *Petromyzontidæ*," in which the author proposes a new terminology of the teeth of these fishes, divides the old genus Petromyzon into *Lampetra* (*marina* Linn.) and *Petromyzon* (*fluviatilis*, *Omalii* and *Planeri*), and cites for the first time *P. Omalii* B., as found in Scandinavia. The *P. Planeri* of Hæckel and Kner, he holds to be distinct from that of Northern Europe; a list of Fishes, Crustacea and Mollusca, new to the Scandinavian fauna, *i. e.*, *Scomber grex* Mitchell?, *Scopelus Kröyeri* (n. sp.), *Accipenser sturioides* (n. sp.), *Eurynome tenuicornis* (n. sp.), *Vanbenedenia Kröyeri* (a new genus and species, with figures of a crustacean parasitic on Chimæra, being found attached to the apex of the dorsal spine), *Nucula tumidula* (n. sp.), *Turbonilla umbilicaris* (n. sp.), *Trophon Morchii* (n. sp.); a Note on *Limnæa limosa*, under which name the author unites a series of forms, hitherto commonly regarded as distinct species (*L. Balthica*, *L. limosa*, *Bennetti*, *succinea*, *vulgaris*, *ovata*, *peregra*), but forming in fact an uninterrupted series of varieties, no doubt derived from the different external agencies and local circumstances that have affected their life and external form; some Remarks on Monstrosities occasioned by a *Syngnathus typhle*, with a double caudal fin; a Monograph of the *Hirudineæ* of Sweden, with beautiful figures from life. In an Appendix several Arctic species are described, and farther additions may be found in the Report of the Association of Scandinavian naturalists, for 1863; a Monograph of the *Limacidæ*, also with handsome illustrations drawn from the living animals. The same active zoölogist has also published, in French, a *Monographie illustrée d'une Ballinoptère frondée le* 2e Oct., 1866, *sur la cote occidentale de Suède*. It is well printed and illustrated by a series of photographs, but not of that scientific importance which might have been anticipated. On the other hand it may be argued that the author's energetical endeavors to secure not only the skeleton, but also the stuffed skin, in such a state that it gives a faithful representation of the animal's appearance, deserves to be fully acknowledged, the more as his health suffered by this gigantic work, and the expense was not repaid by the exhibition of a "Malmo Whale," at Stockholm and elsewhere. The species Malm describes as new (*M. Carolina*), but it has been noticed by Messrs. Flower and Reinhardt to be most likely the *Balenoptera Sibbaldii* Gray. The same author has also contributed some notes on the skeleton of *B. musculus*, to the "Proceedings of the Royal Swedish Academy."

From Finland — that last outpost of Scandinavian civilization towards the East, as is now, alas, another part towards the South — I have not much to report, though natural history was ever cultivated with zeal and success by the people, half Swedish, half Finnish, inhabiting this little favored country, as you will learn from a paper by Prof. Fljelt, "On the Study of Natural History in Finland before the time of Linnæus," in the Contributions to the Knowledge of the Nature and People of Finland, No. 12, published by the Society of Science at Helsingfors. In another number you will find "Geological Observations on the South-western part of Finland." In the *Acta Societatis Scientiarum Fennicæ* (vol. viii), Prof.

Mäklin has published an elaborate monograph of the Strongylium-tribe (heteromerous Coleoptera), with four plates. An interesting biography of the late Prof. Nordenskjold, the celebrated mineralogist and geologist, is also given in the same volume. In the "Proceedings of the Finnish Society of Science" Prof. Lindberg has published several smaller botanical papers, *i. e.*, "On a New Species of *Pimelia* (*P. viridula*) and *Musschea* (*M. pallescens*)"; and "On an abnormal fructification in *Passiflora*," etc.

NATURAL HISTORY MISCELLANY.

BOTANY.

A NEW FRAGARIA.—The Fragaria which I venture, after a careful examination of all the authors within my reach, to pronounce a new one, was brought from Jalapa, Mexico, in the fall of 1858, to Michigan, by Mr. F. Mack. Only one plant survived the journey. From that originated the extensive plantation of J. P. Whiting & Co., of Detroit, who are in vain endeavoring to supply the Western demand for plants, at $3 a dozen. It is known in Michigan as the Mexican Ever-bearing Strawberry, and, according to most reliable testimony, it richly deserves its name. From early June into October—indeed so long as sunlight has strength to ripen berries—it is busy in putting forth fresh flowers and maturing fruit. It is hardy and exceedingly prolific. Its fruit is large, firm, fragrant, sweet, and exquisitely flavored. It belongs to that section of the genus which bears its achenes, or carpels, superficially on the receptacle, and is distinguished from all its congeners by its dichotomous stem and racemose flowers.

In justice to Henry Gillman, Esq., the active and meritorious botanist who first indicated its claims to specific rank, as well as in token of my warm regard for him, I propose for it the name of *Fragaria Gillmani;* and I characterize it thus:

Fragaria Gillmani,—Caule dichotomo, foliis ternatis, foliolis petiolatis, floribus hermaphroditis racemosis, carpellibus superficialibus.

I annex a detailed description furnished by Mr. Gillman:

Stem erect, longer than the leaves, dichotomous, racemose, many-flowered, bearing a perfect trifoliate leaf variously situated from below the middle to the summit of the peduncle, which is clothed with a spreading or deflexed pubescence, more silky, and ascending or appressed on the pedicles and calyx. Leaves coriaceous, coarsely serrate, the serratures ovate-mucronate, rugose, silky villous, the hairs closely appressed, particularly beneath, leaflets petiolate, the two lateral leaflets unequal towards the base, borne on long channelled footstalks, which are clothed with spreading or deflexed hairs. Flower perfect, eight lines in diameter; calyx segments not longer than the roundish spreading petals, the exterior segments or bractlets often cleft or parted, much smaller than the interior segments, which are ovate-lanceolate. Fruit drooping, but always raised far above the ground on the erect stem; bright scarlet, of an irregular conical form, gratefully sweet, sub-acid, singularly fragrant; achenia numerous,

superficial (not sunk in pits), closely covering the surface of the berry, which is produced continuously from June to November. Propagating very rapidly by stolons or runners; also by side stools or offshoots from the central crown, which are tuberous and easily separated. Height of plant twelve to fifteen inches. Perennial; May to November.—[G. W. CLINTON, *Buffalo.*

ZOÖLOGY.

NEW SALAMANDER.—Prof. E. D. Cope informs us that he has just discovered an interesting genus of Salamanders from Mexico. It differs from *Sperlerpes*, in having the parietal and palatine bones unossified, and the inner nares opening into the orbits. The phenygoid teeth are in one patch. Toes, four on the front feet and five on the hind, rudimentary. The tail is as long as the head and body together. The total length is only two inches. It has a pale dorsal band and black sides. A female specimen contained eggs one line in diameter. He has called the species, which is a new generic type, *Thorius pennatribus.*

BREEDING OF RARE BIRDS.—Mr. G. A. Boardman, of Milltown, Me., writes us (Nov., 1868) that he collected the nests and eggs of the following birds in the spring of 1868:—Gos-hawk, Canada Jay, White-winged Crossbill, Pine Finch, and the Pine Grosbeak.

TENNESSEE WARBLER.—In the June (1868) NATURALIST, Mr. Tripp in his interesting article, states that this warbler is not found in New England, or only as a straggler. With us it is one of our very common warblers, and I can collect half a dozen almost any morning about the twentieth of May. A few remain through the season.—G. A. BOARDMAN,

PERCHING OF WILSON'S SNIPE.—In the August (1868) NATURALIST you ask if, like Mr. Pope, any one has observed Wilson's Snipe on trees? This is not an uncommon habit of the bird, when you are taking its nest or catching its young; but I have never observed it at any other time. Of our sixteen species of ducks, I have observed the same thing in all but two, when trying to catch their young.—G. A. B.

MICROSCOPY.

TYPE-PLATE OF DIATOMS.—Möller of Wedel, Holstein, has accomplished the most wonderful feat of modern manipulation, with the exception, perhaps, of Nobert's ruled lines. The slides he prepares have been described to us in the letter of a correspondent, who is the fortunate possessor of two. "The diatoms (four hundred species in all), arranged by genera and species, form groups of one hundred, set with the most perfect regularity and symmetry, and the whole occupies a space of about three-sixteenths of an inch. Each slide is a cabinet,—a collection in itself,—and is accompanied by a catalogue of its contents. This one is called the 'Type Plate,' and cost $40.00. The 'Test Plate,' from the same operator, contains, set in one row with the most perfect regularity, twenty tests, by order of difficulty."

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. — The Eighteenth Meeting of the Association will be held in SALEM, commencing on Wednesday, August 18, at 10 o'clock, A. M. Arrangements are in progress by the Local Committee to make the meeting a scientific success, and a large attendance from all parts of the country is expected.

An interesting feature of the meeting is anticipated in the proposed microscopical gathering, and a large room will be specially devoted to the display of Microscopes, and all that pertains thereto. The Local Committee respectfully requests all persons having first-class instruments, to bring them to the meeting, and also such apparatus as they have found useful in their manipulation. Agents and makers of Microscopes are requested to bring specimens of their different manufactures.

On the afternoon of the first day of the meeting, the Association will be invited to assist in the dedication of the Museum of the Peabody Academy of Science. The Rooms of the Essex Institute and of the Academy, also those of other institutions of the city, will be open during the meeting.

The meetings of the Association will take place in the several halls of the County Court Houses which furnish most ample accommodation for the different sections and committees. The office of the Local Committee will be at the new Court House, where members will be conducted immediately on their arrival in the city.

A circular giving all necessary information relating to the meeting, will be sent to any one requesting it, on application to the Local Secretary. The volume of Proceedings for the Chicago meeting is now nearly printed, and will be ready for delivery at this meeting.

Any person wishing to join the Association can report his name to any of the Secretaries. The entrance fee is $5, and the annual assessment is $3, including the price of the yearly volume of Proceedings.

Farther information relating to the Association can be had by addressing the Local Secretary, F. W. PUTNAM, *Salem, Mass.*

ANSWERS TO CORRESPONDENTS.

J. T., Tabor, Tarrant Co., Iowa. — The impressions are the casts of the crinoid stems found fossil in the rock, from which the pebbles were originally broken off.

E. L. H., Newark, N. Y. — The insect was too much injured for specific identification; it is a hemipterous insect allied to *Redurius*.

R. T., Brookfield, Mo. — The specimens sent were undoubtedly the fungus attacking the larva of the June Bug (*Lachnosterna fusca*), which has been described and figured in Riley's recent Report on the Insects of Missouri injurious to Vegetation.

J. H., Albany, Oregon. — The insects were duly received; many thanks for them. There are several that seem very familiar forms, while some of the moths appear to be new to science.

A. H. G., Plymouth, Ind.—Parasitic worms, in various stages of development, are commonly found in fishes, and it is most probable that every individual has several distinct kinds of parasitic worms living either in the intestines, liver, etc. See p. 218.

W. C. C., Ithaca, N. Y.—The Milleped is *Spirobolus marginatus* Say.

CORRECTIONS.—Dr. Cooper, of San Francisco (who did not see the proofs of his articles on "The Fauna of Montana Territory"), writes us to make the following corrections:

Vol. II, p. 530, line 22, for Mauvaise Territory, *read* Mauvaises Terres. On p. 534, line 18, for Washington Territory, *read* Montana Territory. On p. 535, line 14, for Bat, *read* Rat. On p. 597, last line but one, for Mammal, *read* Manual.

Vol. III, p. 32, dele the query (?) after *Sciurus Noveboracensis*. On p. 34, line 14, for N. W., *read* Arizona. On p. 34, TOWNSEND'S FLYCATCHER, mark out last two lines of paragraph after the word OSCINES, *and insert* "Yet this bird is a magnificent singer in spring." On p. 35, line 10, *Vireo olivaceus? V. Bartramii* Swainson? should read *Vireo olivaceus*. On p. 35, line 17, for *V. gilvus* read *V. Swainsonii* Baird. On p. 76, line 4 from bottom, for *Passerculus* read *Passerculus*. Dr. Cooper writes that we are correct in regard to the Editorial note under *Salmo Suckleyi*, on p. 127.

Vol. III, Pl. 2. "The artist has inserted conic teeth in the jaws of the Hadrosaurus which do not exist. The claws of Lælaps are incorrect, not being nearly sufficiently hooked. The nostril is much more anterior than given in the drawing. The eyes of Mosasaurus are not symmetrical; in the same way, one of those of Elasmosaurus is vertical and one lateral. The tail of Elasmosaurus is not continuous with what ought to be tail, but is made body."—E. D. COPE.

BOOKS RECEIVED.

Seventeenth Annual Report of the Directors of the New York Ophthalmic Hospital, 1868. New York, 1869. 8vo, pp. 15.

A Contribution to the Study of Human Milk. By T. F. Allen, M. D. Albany, 1868. 8vo, pp. 11.

Action of Anæsthetics on the Blood Corpuscles. By J. H. McQuillen, M. D. Philadelphia, 1869. 8vo, pp. 7.

Land and Fresh-water Shells of North America. Part I. *Pulmonata geophila.* By W. G. Binney and T. Bland. 8vo, 1868. Smithsonian Institution, Washington, D. C.

Flora of Alaska. By J. T. Rothrock, M. D. 8vo, pp. 30. Smithsonian Institution, 1868.

Washburn's & Co's Amateur Cultivators' Guide to the Flower and Kitchen Garden; containing a Descriptive List of two thousand varieties of Flower and Vegetable Seeds; also a List of French Hybrid Gladiolus raised and imported by Washburn & Co. Boston, Mass. Illustrated. 8vo, pp. 152.

The Naturalist's Note Book. March, April, 1869. London. 4d. a number. Small 4to.

Chemical News. March, April, May. New York.

Cosmos. February 27, May 1, 1869. London.

Observations on the genus Unio; together with Descriptions of New Species in the Family Unionidæ, and Descriptions of New Species of the Melanidæ and Paludinæ. By Isaac Lea, LL. D. 4to, with twenty-six plates. Philadelphia, 1869. From the Journal of the Academy of Natural Sciences, Vol. xii.

Hardwicke's Science-Gossip. March, April, 1869. London.

The Butterflies of North America. By W. H. Edwards, Philadelphia. Part 3, $2,50.

Scientific Opinion, Parts iv, March, v, April, 1869. London.

Le Naturaliste Canadien, No. iv, March, No. v, April, 1869. 8vo. Quebec.

American Bee Journal. April, 1869. Washington: S. Wagner. $2.00.

The Canadian Naturalist and Geologist. New Series, Vol. iii, No. 5. June, 1868. No. 6, December, 1868. 8vo, $3.00, gold.

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